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**REASONING PROCESSES IN THE
DEVELOPMENT AND MAINTENANCE OF
OBSESSIVE-COMPULSIVE DISORDER**

ACADEMISCH PROEFSCHRIFT

TER VERKRIJGING VAN DE GRAAD VAN DOCTOR

AAN DE UNIVERSITEIT VAN AMSTERDAM

OP GEZAG VAN DE RECTOR MAGNIFICUS PROF. MR. P.F. VAN

DER HEIJDEN

TEN OVERSTAAN VAN EEN DOOR HET COLLEGE VOOR

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VERDEDIGEN IN DE DOELENZAAL DER UNIVERSITEIT

OP WOENSDAG, 4 MEI, 2005, TE 13 :00 UUR

DOOR FREDERIKUS JACOBUS AARDEMA

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GEDRAGSWETENSCHAPPEN

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Chapter 1

Introduction¹

The measurement and conceptualization of cognition in OCD

Cognitive models of obsessive-compulsive disorder (OCD) emphasize cognitive distortions and beliefs in the development and maintenance of this disorder. The initial clinical application of cognitive principals in the treatment of OCD was carried out by the pioneering work of Emmelkamp and colleagues (Emmelkamp & Beens, 1991; Emmelkamp, Van der Helm, Van Zanten, Plochg, 1980; Emmelkamp, Visser, & Hoekstra, 1988) who investigated treatment based on changing irrational beliefs. Since then, the attention has shifted away from a focus on irrational beliefs in general towards identifying specific dysfunctional beliefs in OCD, based on Beck's (1976) cognitive specificity hypothesis, which holds that different psychological disorders are characterized by different dysfunctional beliefs (see Taylor, 2002a). The theoretical application of cognitive models to OCD, in particular Beck's model of psychopathology, found its culmination in the work of Salkovskis (1985, 1989) who argued it is not the unwanted thought or intrusive cognition that leads to distress and compulsive behaviours, but how the person appraises these thoughts in terms of personal responsibility. Similarly, Rachman (1997) has argued that it is not the intrusive cognitions that causes distress and compulsive behaviours, but the consequences of these thoughts in terms of personal significance.

¹ O'Connor, K.P, Aardema, F., Pélissier, M.C. (2005). *Beyond Reasonable Doubt: Reasoning Processes in Obsessive-Compulsive Disorders and Related Disorders*. © John Wiley and Sons Ltd. Reproduced with permission.

In these appraisal models the occurrence of the obsession came to be sharply delineated from the subsequent appraisal of the obsessional thoughts. The 'normal' nature of obsessions was indeed supported in several studies which found that intrusive cognitions share a similar content with obsessions in approximately 80%-90% of non-OCD populations (Rachman & de Silva, 1978; Salkovskis & Harrison, 1984). However, it has recently been suggested that this argument may have been taken too far in that there are important inference processes, which go beyond content considerations, that may play a role in the production of obsessions before appraisals or beliefs come into play (Clark & O'Connor, in press).

The original work of Rachman (1997) and Salkovskis (1985, 1989) has guided most of the research on OCD, and the main impetus of research since then, has been to identify other types of beliefs and appraisals that may play a role in the development of OCD, while pre-existing concepts such as overestimation of threat (Carr, 1971), intolerance to uncertainty (i.e. 'intolerance to ambiguity'; Frenkel-Brunswick, 1947), and perfectionism (Frost, Novara, Rheame, 2002) still struggle to find their place in the appraisal model of OCD as specific obsessive-compulsive beliefs, rather than markers for anxiety disorders in general. More recent beliefs that have been proposed to be relevant to OCD are beliefs concerning the necessity to control thoughts (Purdon & Clark, 2002), Thought-Action Fusion (Rachman & Shafran, 1999), and beliefs or appraisals in general concerning over-importance given to thoughts (Freeston, Rhéaume, & Ladouceur, 1996).

The Obsessive-Compulsive Cognition Working Group (OCCWG) has attempted to identify the most important belief domains in an attempt to bring clarity in the multitude of cognitive variables proposed to be relevant to OCD (OCCWG, 1997). This work has ultimately resulted in the Obsessive beliefs Questionnaire (OBQ) focusing on six belief domains, namely intolerance to uncertainty, importance of controlling one's thoughts, perfectionism, inflated responsibility, overestimation of threat and over-importance of thoughts (OCCWG, 2001, 2003). Although this measure does not claim to be exhaustive with respect to the measurement of cognitive beliefs that can may be relevant to OCD, it has advanced the measurement of cognitive factors involved in OCD, and improved the ability to answer important research questions, which were previously limited by the sheer multitude of cognitive constructs proposed to be relevant to OCD. However, none or only

some of the OBQ domains can claim to be specific to OCD (Clark, 2002a; Taylor, Kyrios, Thordarson, Steketee & Frost, 2002), and the ability of these cognitive variables to explain OCD symptoms has been rather disappointing. Also, problems of overlap among these domains remain, and the question has been raised whether the OBQ measures irrational beliefs in general (Taylor, 2002a) or is better accounted for by negative mood states (Emmelkamp, 2002). It has also been suggested that the cognitions proposed to be relevant in OCD themselves require an explanation (Jakes, 1996; Taylor, 2002a). In fact, they argue that if appraisals and beliefs play some role in causing OCD, it is important to identify the causes of these beliefs and appraisals.

There is also the question of potential overlap between cognitive measures and personality traits. For example, Aardema (1996) found that scores on measures such as the Irrational Beliefs Inventory (Koopmans, Sanderman & Timmerman, Emmelkamp, 1994) could in large part be explained by personality (54%), in particular neuroticism (45%). In this regard, it is disturbing that the trait-like characteristics or beliefs that have been identified to be relevant to obsessive-compulsive disorder are often reminiscent of the same characteristics that have been identified in obsessive-compulsive personality disorder (OCPD). For example, perfectionism and mental control is one of the characteristics of OCPD in DSM-IV-TR, while the link between inflated responsibility and OCPD is easily made. Even a concept such as intolerance to uncertainty, which appears to originate from the early work of Frenkel-Brunswick ('tolerance to ambiguity'; 1949), and which was originally primarily associated with rigidity, has indirectly become wound up with OCD through the work of Hamilton who found obsessive-compulsive patients tended to avoid ambiguity on self-report ratings (1957). Clearly, the advent of the appraisal model has inherited several concepts already in place. Yet, OCPD has not been shown to make a person more vulnerable to develop OCD (see Baer & Jenike, 1998). Thus, the initial enthusiasm of this endeavour to 'explain' OCD in terms of cognition by gathering a sufficient amount of measures of cognitive variables that would accommodate the entire spectrum of obsessive-compulsive symptomatology has lost some of its lustre. Perhaps it is starting to become increasingly clear that OCD is not akin to a personality disorder,

which can maybe be partially described, but not explained, in terms of an exhaustive set of beliefs and trait-like variables.

One of the main reasons for the tendency of cognitive models to focus on beliefs or trait like characteristics in OCD is the assumption that all psychological disorders must be characterized by specific beliefs relevant to this disorder as per the cognitive specificity hypothesis of Beck. The emphasis on beliefs to explain OCD has led to perhaps somewhat contrived and unnecessary attempts to phrase cognitive variables in terms of beliefs, while in fact some of the cognitive domains in the OBQ are more reminiscent of process variables or biases rather than particular beliefs. For example, the OCCWG has defined overestimation of threat as ‘...beliefs indicating an exaggerated estimation of the probability or severity of harm’ , or intolerance to uncertainty as ‘...beliefs about the necessity for being certain’ (see Taylor, 2002b, p. 7). The tendency to phrase cognitive distortions or process variables in terms of specific beliefs, is rather surprising, since the appraisal model of OCD was derived from Beck’s theory of psychopathology, which does make an explicit distinction between cognitive beliefs and cognitive distortions or processes. However, cognitive accounts of OCD have failed to make such an explicit distinction between process and content characteristics of OCD, or at least, the distinction between content and process has become quite blurry over the last decade.

Traditionally, cognitive process variables have been associated with an information processing paradigm and are often taken to refer to processes such as attention, perception and memory. However, other types of cognitive processes have been identified, which find their origin in clinical observations and reasoning based paradigms rather than pure information processing theory. The most well-known of these are Beck’s cognitive distortions such as overgeneralization, all-or-nothing thinking and personalization. These types of cognitive processes have been almost completely ignored in popular cognitive models of OCD, and no attempts have been made to explicitly identify if these types of cognitive distortions operate in OCD.

Characteristically, process variables operate independently from specific mental content, and may apply to a wide variety of mental contents. For example, the cognitive distortion ‘overgeneralization’ is not necessarily concerned with any particular content, but can apply to a variety of types of

information. Even so, the delineation between process and content is often not entirely clear. The lack of delineation between process and content is intrinsic to the nature of these concepts. Generally, process variables deal with cognitive features of OCD that are not bound to *specific* thoughts and beliefs, but concern themselves with the *operation* of cognition. However, cognitive processes require content to operate upon, and without content there would be no process. Thus, process variables can differ with respect to their domain width, ranging from formal approaches dealing with information processing in general, and not limited to a specific category of information, through to cognitive processes that pertain to a specific content domain (i.e. overestimation of threat). An example of an approach focusing purely on the form of obsessions would be Reed's (1985) cognitive structural approach to OCD that identifies a central process characterizing OCD as a tendency to over-classify of events and information regardless of the content of the thoughts. In the words of Reed (1985, p. 214) : ``...if radio reception is distorted, we examine our receiver rather than the newscaster's announcements``.

Thus, despite the inherent symbioses between process and content, the distinction is important, since it inevitably leads to different cognitive formulations of psychological disorders, research questions and even interpretation of results. For example, in early experimental research on OCD Milner, Beech & Walker (1971) suggested obsessional patients show a need for certainty to terminate ordinary activities. In a task that required the identification of a particular sound amidst white noise the obsessional patients asked more often for a repetition of the sound than a control group. However, these results can both be interpreted as a need for certainty representing a particular belief or trait-like characteristic of OCD or as tendency to doubt what was seen or heard correctly as the result of particular process characteristics operating in OCD.

Historically, doubt has always figured as an important characteristic of OCD (Janet, 1903), but is presently only given a marginal role in cognitive accounts of this disorder. However, several authors consider pathological doubt and uncertainty a prominent cognitive characteristic that pervades obsessional thinking (Ribot, 1904; Rasmussen & Eissen, 1992; Reed, 1985). While initially the application of Beck's model to OCD by Salkovskis (1985) almost appeared to equate doubt with intrusive cognitions (see p. 578, figure

1), it has almost completely fallen from view since then. The neglect of doubt as a pervasive characteristic of OCD in current cognitive accounts is not entirely surprising. The concept of doubt does not lend itself well to appraisal formulations of OCD, since doubt is mental state, which is more reminiscent of a particular cognitive process operating independently from specific content, rather than a particular belief. Besides the 'normalization' of intrusive cognitions, which inadvertently subsumed doubt under the same category, as mentioned before, the tendency has been to identify specific beliefs relevant to OCD rather than process characteristics or cognitive distortions.

However, there are several reasons to assume that a process-oriented approach to OCD may be a more fruitful line of research than a focus on specific beliefs and appraisals in OCD. Phenomenologically speaking, OCD is not as clearly defined in terms of pervading beliefs and feelings such as in depression where themes such as hopelessness and worthlessness come to the foreground in a relatively uniform way. In fact, the clinical manifestations of OCD are so varied that some authors have doubted whether all these varieties can be subsumed under the label 'obsessive-compulsive disorder' (see Reed, 1985). Obsessions do not exist in a vacuum, and while the senseless and ego-dystonic nature of obsessions is sometimes emphasized as a characteristic of OCD, this disorder tends to find its way towards content domains that in one way or another, and often indirect ways, has some sort of personal relevance or importance to the individual involved, and hence obsessions often take a (semi)-idiosyncratic form. The idiosyncratic content of obsessions can be striking, and even though there are clearly subgroups of OCD patients with particular types of obsessions, clinical evidence suggests that the reasoning behind the same type of obsessions shows great variety in terms of cognitive content. Recognition of the idiosyncratic content of cognitive variables in OCD has led some to suggest that more idiosyncratic measures may be needed to assess cognitive characteristics in OCD, since current measures of obsessive beliefs like the OBQ may reflect mood states rather than deeper cognitive structures (Emmelkamp, 2002). However, the difficulty with identifying specific obsessional beliefs may be intrinsic to the phenomenology of obsessive-compulsive disorder. That is, there may be no schema containing

specific beliefs that cause this disorder, but rather patterns in reasoning that may revolve around any type of mental content or belief.

An inference based approach (O'Connor & Robillard, 1996; O'Connor & Robillard, 1999) bypasses the problem of idiosyncratic content in OCD, since instead of identifying specific beliefs or appraisals in OCD it emphasizes the reasoning *process* that is associated with the occurrence of obsessions. As mentioned before, without cognitive content there is no cognitive process, since cognitive processes require mental content to operate upon, but rather than identifying *specific* mental content, an inference based approach locates specific reasoning errors or distortions proposed to be specific to OCD in idiosyncratic narratives that form the justification behind a particular obsessional doubt. Such an approach is entirely cognitive in nature and is loosely affiliated with information processing and neuropsychological paradigms without losing contact with the phenomenology of OCD and clinical applications, but it deviates from other cognitive models of OCD in that it does not locate the origin of obsessions in intrusive cognitions, nor in specific appraisals guided by specific beliefs that make these intrusive thoughts seem beyond control.

The inference based approach

A theoretical repositioning regarding the normal nature of intrusive cognitions is perhaps long overdue especially since Rachman (1980) already stated in his seminal work 'Obsessions and Compulsions' that a conceptualization of obsessions as intrusive cognitions was unsatisfactory. The question as to how best conceptualize intrusive cognitions is tremendously important, since it forms the basis of appraisal models of OCD, and has led to the current emphasis on specific beliefs and appraisals in OCD both in theory and measurement, while at the same time characteristics of the obsessions themselves and the particular way that they arise have been given limited attention. However, recently the normal nature of intrusions has been questioned in terms of process rather than in content (O'Connor, 2002). Initially, this observation was already made by Rachman & DeSilva (1978) who stated that even though intrusive cognitions may often be normal in content, the particular way by which they arise may be different in OCD patients than in normals.

The matter of similarities in content between intrusive cognitions and obsessions is not of crucial importance to an inference based approach which views obsessions as the product of several errors in reasoning (O'Connor & Robillard, 1995), and not of any particular type of content. However, cognitive-behavioural models that locate the genesis of obsessions in intrusive cognitions may not have such a solid foundation to begin with, and the link between intrusive cognitions and obsessions can even be questioned in terms of content rather than in terms of process alone. Studies reporting similarities in content between obsessions and intrusive cognitions in the general population have recently been criticized on the grounds that the experience of "normal obsessions" in the general population may have been inaccurately portrayed in that more frequently endorsed intrusions are more likely examples of anxious or even depressive thinking (Clark & Purdon, 1995; Clark & O'Connor, 2002).

More importantly, there is the form of obsessions, which is not very well-captured by the term intrusive cognitions, and this issue is particularly relevant to an inference based approach to OCD (O'Connor, 2002). That is, intrusive cognitions have been likened to mental flotsam (Rachman, 1980) or the result of automatic processes (Salkovskis, 1989), which presupposes them to be a spontaneous occurrence that requires little or no further explanation. However, obsessions often take the form of a particular inference of doubt ("perhaps I left the door unlocked"; "maybe my hands are dirty"), which in fact would suggest a reasoning process preceding the occurrence of the obsession unlike a passing thought.

An inference is essentially a plausible proposition about a possible state of affairs, itself arrived at by reasoning but which forms the premise for further deductive/inductive reasoning (O'Connor, 2002). The inference is logically implied by the compulsive acts characterizing OCD, and even though some have reported difficulties in identifying obsessions associated with certain compulsions, an appropriate logical template inevitably leads to uncovering the obsessional inference (O'Connor & Robillard, 1999). That is, if the person washes his/her hands then the action implies that the person must have inferred that there might be something on his/her hands. If the person checks whether or not the door is locked then there must be an inference with respect to the possibility that the door is left open. The inference of doubt is already emotionally charged and leads to a spiralling

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chain of second possibilities, all of course, negative. In fact, we can quite distinctly identify two thought components to the doubt: the primary inference of doubt “maybe the stove is on” and its consequences or secondary inference “if the stove is on, the house will catch fire, I’ll lose everything and etc...” It is this latter secondary inference that contemporary appraisal models of OCD tend to focus on rather than on the original primary inference of doubt.

In sum, a conceptualization of obsessions as inferences leads to a different set of questions than those posed by an appraisal model, which locates the genesis of obsessions in intrusive thoughts. In fact, if obsessions develop from the appraisal of intrusive cognitions then the obsessions themselves require no further explanation, and the focus would solely be on their appraisal. In contrast, a conceptualization of obsessions as problematic inferences would raise questions as to how these inferences come about in order to explain their persistence and intrusive character. Thus, in the inference based model there is no such thing as an intrusion (O’Connor, 2002). Rather, an ‘intrusion’ is an inferred state of affairs that comes about through distorted reasoning processes. The main differences in conceptualization between an inference and appraisal based model can be schematically presented in the following way:

Intrusion → Evaluation → Reactions to the evaluation
(Salkovskis, 1999)

Internal/external percept → Primary inference → Secondary consequences
and evaluations (O’Connor, 2002)

Figure 1. Schematic representation of the appraisal and inference based model.

Clinical evidence suggests that these initial inferences are supported by an inductively generated idiosyncratic narrative which employs one or several rhetorical devices to strengthen the obsessional doubt. These reasoning processes can be viewed as cognitive distortions, similar to the cognitive distortions proposed by Beck (1979), but with hypothesized unique relevancy to OCD (see table 2).

Table 2. Overview of distorted inference processes in OCD.

Distorted Inference processes	Examples
<u>Category errors:</u> Confusing two logical or ontologically distinct properties or objects.	<i>"If this white table is dirty, it means the other needs cleaning."</i>
<u>Apparently comparable events:</u> Confusing two distinct events separated by time, place, and/or causal agency.	<i>"My friend often leaves the garage door open, so mine could be left open."</i>
<u>Selective use of out-of context facts:</u> Abstract facts are inappropriately applied to specific personal contexts.	<i>"Microbes do exist so therefore there might be microbes on my hand."</i>
<u>Purely imaginary sequences:</u> Making up convincing stories and living them.	<i>"I imagine the waves entering my head and I can feel them infecting my brain."</i>
<u>Idiosyncratic associational networks:</u> Creating chains of arbitrary associations or rules.	<i>"If I count to 6, this means I'm safe, unless someone passes by."</i>
<u>Distrust of normal perception:</u> Disregarding the senses in favor of going deeper into reality.	<i>"Even though my senses tell me nothing is there, I know by my intelligence that there is."</i>
<u>Inverse inference</u> – Inferences about reality precede reality rather than follow from observation of reality.	<i>"A lot of people must have walked on this floor, therefore its certainly dirty."</i>

From O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre (2004).

The reasoning errors outlined in table 2 are proposed to be embedded in idiosyncratic narrative content, and although the content is clearly inherently intertwined with these reasoning processes, these processes are not limited to any specific content by obsessional narratives in general. An example of such an idiosyncratic narrative which convinces the person that her hands are dirty is the following:

*“So I say to myself: Well, my kids were playing outside and like I know it’s dirty outside (**selective use of fact**). I’ve seen the dirt on the pavement and I think they may have touched something dirty (**category error**), like picked up something from the street, dirty paper or dog shit, and then I say well if they’re dirty then I’m going to be dirty (**apparently comparable events**) and I’m going to make the house dirty, and I imagine the house dirty and me with my dirty hands, so I start to feel dirty (**imaginary sequence**). So I go in and wash and I can’t stop, you know, it’s like a voice in my head, saying over and over again, you’re dirty, even though you’re washing and see nothing (**distrust of normal senses**), you could still be dirty (**inverse inference**). “ (From From O’Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre (2004).*

This confusion of a subjective discourse with reality, complete with some or all of the above reasoning errors, we term **inferential confusion**. Such people with OCD, however, do not appear to have any problems perceiving or sensing reality, it seems rather that the certainty of correctly perceived information is replaced by doubt generated through “inferential confusion”, so resulting in the belief that “maybe” a state of affairs is possible despite contradictory evidence from the senses. Clinically, such a conceptualization highlights the persistent character of the obsession as an essential feature in OCD. In contrast to normal doubts, which are generated by reality based information, obsessional doubts are not readily resolved because they are generated more subjectively. For example, the person who washes their hands continuously on the basis of a doubt that invisible dirt may be present,

will have difficulty deciding whether or not his/her hands are clean if this washing was initiated on the basis of purely subjective information to begin with.

Clearly, the reasoning errors outlined above show common overlap, since they all share the common element of going beyond reality, which leads to inferential confusion. Thus, an essential feature of inferential confusion is the *distrust of the senses* and *inverse inference* - an inverse type of reasoning where the person does not start out with the senses in reaching an obsessional inference or doubt, but instead comes to infer this doubt without any actual indication of it being present or even in contradiction to what is seen or sensed. That is, the obsessional inference does not come about as the result of entertaining a particular possibility (maybe my hands are contaminated; maybe I drove over someone with my car) that has any basis in reality or the senses, but instead, this doubt is generated as the result of purely subjective reasoning. As such, O'Connor & Robillard (1996) propose OCD does not follow a phobic model of development where the person exaggerates that which is seen or felt (for example, spider phobia), but that the person with OCD fears exactly those things, which cannot be seen or sensed.

Phobic and non-phobic models of development in OCD

The concept of inferential confusion was inspired by clinical observation of OCD with overvalued ideation (O'Connor & Robillard, 1995). Fixed beliefs with a strong personal investment have been observed in a variety of psychiatric complaints, but overvalued ideation is generally located on a dimension between obsessions and delusions (Jaspers, 1991, 1963; Spitzer, Williams, Gibbons, & First, 1991). The overlap between OCD and Delusional Disorder has been a matter of debate for some time, and the nature of overvalued ideation is an important element in determining whether OCD itself is best characterized as an anxiety disorder or a schizotypal disorder (Enright & Beech, 1990; O'Dwyer & Marks, 2000). It is recognized that similarities between both disorders may only be partial in that delusional disorder has several other dimensions such as systematization of belief, lack of insight about the belief causing distress and the type of emotions typically associated with the belief (O'Connor, in press).

Essentially, an inference based approach (IBA) conceptualizes OCD as a belief disorder rather than locating its causal development in the exaggeration of normal passing thoughts. The imaginary nature of representations has always figured as an important cognitive characteristics of delusional and related disorders where the person's beliefs deviate to a great extent from objective and/or consensus reality, but has given no wide application in current 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 as they occur in here and now, then there may be reason to assume that OCD does not primarily follow a phobic model of development (O'Connor & Robillard, 1996). Instead of conceptualizing OCD solely as the result of 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 of what is there, but to what might possibly be there even though the person's senses say otherwise" (O'Connor & Robillard, 1995, pg. 889). This would locate OCD in the different spectrum of related disorders than those of an appraisal model (see figure 2a and 2b).

Anxiety Disorders

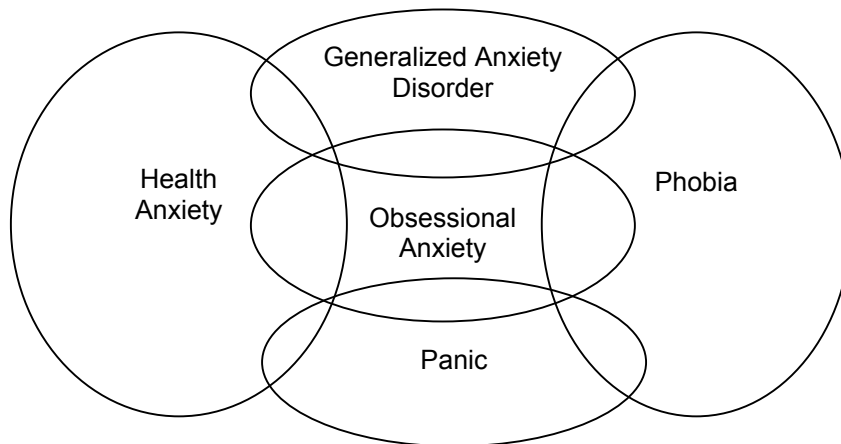


Figure 2a. Diagnostic spectrum of anxiety disorders (O'Connor et al, 2004).

Belief Disorders

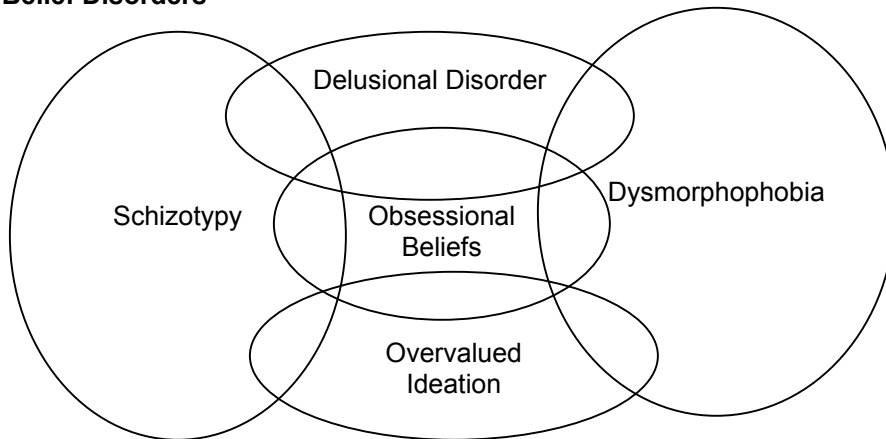


Figure 2b. Diagnostic spectrum of belief disorders (O'Connor et al, 2004).

While the concept of inferential confusion was inspired by observation of OCD with overvalued ideation, the exact nature of this relationship is still unknown. The concept of overvalued ideation itself is ill-defined, and Veale (2002), while providing a conceptual analysis of overvalued ideas, argues for a better understanding of overvalued ideas, and that an advancement in assessment is required, for this often neglected area of psychopathology, as well as novel treatments that specifically target overvalued ideas. However, it still remains to be seen whether inferential confusion is a concept that is particularly relevant to a subgroup of OCD patients, or whether it represents a process characteristic operating in OCD

in general. For example, inferential confusion (i.e. a tendency to negate and distrust the senses) may operate on a continuum ranging from obsessional doubt to pathological certainty, and represent a separate dimension from the high conviction levels seen in OCD with overvalued ideation.

Treatment considerations

Despite advances in cognitive-behavioural formulations of OCD this has not led to improvements in treatment outcome. The early studies of Emmelkamp and colleagues did not show any added benefit of including cognitive interventions in the treatment of OCD as compared to exposure in vivo (Emmelkamp & Beens, 1991; Emmelkamp, Visser, & Hoekstra, 1988). Treatment studies carried out since then, focusing on changing specific obsessive-compulsive beliefs, yielded similar results (Van Oppen, Haan, van Balkom, Spinhoven, Hoogduin, & van Dyck, 1995).

In part, the lack of additional benefit from cognitive interventions in OCD treatment may be due to the self-imposed restriction of appraisal models which address the appraisal of intrusive cognitions, rather than the 'intrusion' or primary inference. However, if the content of the initial intrusion or inference holds an intrinsic meaning reflected in a higher than normal conviction it will dictate the strength of subsequent reactions. Hence, where obsessional conviction is high, the intrusion and appraisal are inherently linked and the obsessional sequence begins with the intrusions.

Clinically speaking, the inference based model would suggest that all intrusions, even non-bizarre ones, are in fact inferences. Even though addressing the initial doubt or primary inference rather than the consequences of the doubt, may not be *necessary* to dispel distress, it should be *sufficient* to dispel distress since, in the IBA model, it is ultimately the trigger for the secondary distressing appraisal.

Exposure and response prevention remains the treatment of choice for OCD with however a high treatment refusal rate and with variable effects on cognitive and emotional factors. Also, implicit in the inference based model is that OCD should be treated as a belief disorder, so in a sense one could view exposure in vivo with response prevention and the cognitive appraisal model as dealing with the anxiogenic thought and behaviour feeding discomfort after the belief formation and the inference based model as dealing with reasoning processes preceding belief formation. All three

models are not incompatible, particularly if one considers that in non-overvalued ideation, according to an inference based approach, it is not the *content* of the intrusions, but the *context* of its arrival on the scene which is problematic. In other words, even if the content of the intrusion may frequently be normal, the reason for the same doubt arriving in a non-OCD sample may be more realistic and in an OCD sample more the product of subjective reasoning.

The identification of central cognitive markers in OCD

What are the prospects for identifying central cognitive markers in OCD through self-report, in particular, the inference processes as described by O'Connor and colleagues (O'Connor & Robillard, 1995; O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre, 2004). According to Taylor (2002), despite difficulties in the assessment of cognitions through psychometric means, these methods should not be undervalued either. In an insightful review on cognitive variables in OCD, he draws a parallel with research on cognitive factors in panic disorder where the construct of anxiety sensitivity has been proposed as central to this disorder, and recent evidence suggests that a combination of learning experiences and genetic factors influences the level of anxiety sensitivity. However, the particular types of obsessive-compulsive beliefs that play a central role in OCD have yet to be established, and it remains to be seen whether appraisals and beliefs identified so far are not epiphenomena of more central cognitive characteristics of this disorder. Thus, despite advances in measurement research into cognitive variables of OCD still presents an enormous challenge.

A particular complicating factor in identifying central cognitive markers for OCD is overlap between these measures, which represents a difficult challenge for researchers carrying multidimensional investigations (Clark, 2002). Even if cognitive measures show adequate differential validity by conventional standards they leave open alternative hypotheses of findings that reflect more central cognitive markers. Since the relationship between cognitive measures and OCD tends to be rather modest, there is little leeway to establish unique variance while controlling for other measures. However, due to the overlap between cognitive variables and other measures cognitive markers of OCD cannot be introduced without

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controlling for mood states and other cognitive measures. New and existing cognitive measures need to establish their differential validity and unique contribution to obsessive compulsive symptoms as compared to other cognitive measures, mood states, and perhaps even personality traits. This places a considerable burden of proof on researchers who wish to introduce new cognitive concepts that may be relevant to obsessive-compulsive disorder, or those that wish to continue with investigating existing measures of cognitions and determine their unique relevancy to OCD. However, this requirement may eventually clarify, which markers are fundamental, and specific to OCD, and which cognitive variables are epiphenomena of these central cognitive markers. In particular, this would open the doorway to experimental studies that can specifically target the cognitive variables in question (Rachman, 2001), and eventually reveal learning experiences and genetic factors involved in OCD (Taylor, 2002a).

The topic of the current thesis is to establish the role of inference processes in OCD, and investigate several of the claims put forward by an inference based model to OCD. These claims have been investigated through psychometric means in a series of steps and stages with the following principal aims:

1. The development of a questionnaire to measure inference processes.
2. To establish whether inferential confusion is a cognitive construct relevant to OCD.
3. To investigate the unique relevance of inferential confusion in OCD as compared to other cognitive measures.
4. To establish whether or not inferential confusion is a central cognitive marker of OCD.
5. To investigate the effects of inferential confusion on treatment outcome.

Outline

The chapters outlined in the paper are a compilation of research carried out in the last few years that attempts to investigate the goals mentioned above.

Chapter 2 is an exploratory paper in a non-clinical sample and represents the first measurement of inferential confusion (i.e. inverse

inference). It compares the predictive validity of inferential confusion for obsessive-compulsive symptoms compared to other cognitive domains in a non-clinical sample. At the time of the study the OBQ was not yet in existence, and this study provides a good illustration of the multitude of cognitive variables that have been proposed to be relevant to obsessive-compulsive disorder. The study is limited with respect to the sheer number of cognitive variables investigated, but it clearly demonstrates that some cognitive domains are only related to specific obsessive-compulsive symptoms while at the same time it established inverse inference as a promising characteristic of obsessive-compulsive symptoms independently of the form.

Chapter 3 represents the further development and validation of the inferential confusion questionnaire in a non-clinical sample, and specifically focuses on its relationship with schizotypal symptoms and obsessive-compulsive symptoms. The results of this study confirmed the validity and reliability of the ICQ in a normal population and established inferential confusion as a cognitive process operating in both OCD and schizotypal symptoms.

Chapter 4 presents the final version of the Inferential Confusion Questionnaire (see appendix 1) as established and validated in three clinical and control samples. This study established inferential confusion as a construct in OCD that adds significantly to the variance explained in obsessive-compulsive disorder and beyond that already explained by other cognitive domains and negative mood states. Moreover, it suggests that inferential confusion is particularly relevant to OCD and Delusional Disorder with these groups scoring significantly higher than anxious and non-clinical controls.

Chapter 5 specifically addresses the relationship of inferential confusion with obsessive-compulsive belief domains. The results of this study suggest that inferential confusion is an important cognitive marker in OCD that appears to take precedence over obsessive-compulsive beliefs. Also, it addresses the important question of overlap between inferential confusion and overestimation of threat. Results indicated that both constructs are factorially distinct with the construct of inferential confusion remaining significantly related to obsessive-compulsive symptoms while controlling for anxious mood states.

Chapter 6 is the final empirical paper investigating the role inferential confusion and cognitive change in treatment outcome in a sample receiving standard cognitive behavioural therapy. Results show that change in inferential confusion is an important marker for treatment outcome.

Chapters 7 represents the latest theoretical developments in an inference based approach to OCD, and the application of such an inference based approach to OCD without overt compulsions. It is argued the ruminations in OCD without overt compulsions result largely from thoughts about thoughts that do not actually occur. The person with obsessions thinks they might have or might have had the thoughts, and through the meta-cognitive process of 'inferential confusion' confuses these imagined thoughts with actual thoughts.

Finally, Chapter 8 provides a resume of the findings in this thesis, and addresses future research developments.

Chapter 2

Metacognition, Specific Obsessive-Compulsive Beliefs and Obsessive-Compulsive Behavior ¹

Abstract

Cognitive distortions and beliefs have been found to be associated with obsessive-compulsive disorder. Most of these beliefs and cognitive distortions are supposed to be non-specifically related to obsessive-compulsive behaviour in general, rather than specific domains of belief being related to specific forms of obsessive-compulsive behaviours. In this study 305 subjects from the community completed a number of questionnaires assessing specific belief domains, obsessive-compulsive behaviour (Padua-R) and depressed mood (CES-D). Multiple regression analyses provided support for the notion that specific beliefs are associated with specific forms of obsessive-compulsive behaviour (i.e. washing, checking, precision, rumination and impulses). Further, as expected, meta-cognitive beliefs or distortions such as Thought-Action Fusion and Inverse Inference were found to be related to most forms of obsessive-compulsive behaviour. Depressed mood did not affect the results substantially.

¹ Emmelkamp, P. M. G. and Aardema, F. (1999). Metacognition, specific obsessive-compulsive beliefs and obsessive-compulsive behaviour. Clinical Psychology and Psychotherapy, 6, 139-145. © John Wiley and sons Ltd. Reproduced with permission.

INTRODUCTION

In the last decade an increasing number of studies have focused on beliefs and cognitive processes characteristic of obsessive-compulsive patients. A number of belief domains appear to be particularly relevant to obsessive-compulsive disorder (OCD), including specific obsessive-compulsive beliefs and meta-cognitive beliefs (Nelson, Stuart, Howard & Crowley, 1999). Several authors attribute an important role to *inflated responsibility* in OCD, particularly in checking (e.g. Salkovskis, 1985; Rachman, 1993; van Oppen & Arntz, 1995) which was indeed supported in several experimental studies (e.g. Ladouceur, Rheume, Freeston, Aublet, Jean, Lachance, Langlois & De Pokomandy-Morin, 1995; Lopatka & Rachman, 1985). Further, responsibility was significantly correlated with obsessive-compulsive behaviour (Rheume, Freeston, Dugas, Letarte & Ladouceur, 1995; Rheume, Ladouceur, Freeston, Letarte, 1995).

Inflated responsibility may be related to a lack of attributional processes characteristic of normal individuals originally described by Spranca, Minsk & Baron (1991). In contrast to non-OCD patients, who hold that they are to blame for errors of commission, rather than for errors of omission, OCD patients are supposed to believe that they are equally culpable for *errors of omission* as for *errors of commission* (OCCWG, 1997).

Another cognitive belief described as *Thought-Action Fusion* (TAF) is defined as the belief that (one's) specific intrusive thoughts can directly influence the relevant external event and/or the belief that having these intrusive thoughts is morally equivalent to carrying out a prohibited action (Rachman & Shafran, 1999). TAF was found to correlate significantly with measures of obsessionality, guilt and depression (Rachman, Thordarson, Shafran & Woody, 1995).

Others have argued that OCD is related to *perfectionism*, but there is no evidence for the discriminability of measures of perfectionism across different patient categories. Although there is a relationship between OCD and perfectionism (Rheume, Freeston, Dugas, Letarte & Ladouceur, 1995a; Frost & Steketee, 1997) this is not specific to OCD, since perfectionism has also been found to be related to performance anxiety (Mor, Day, Flet & Hewitt, 1995), social phobia (Juster, Heimberg, Frost, Holt,

Mattia & Facenda, 1996), panic disorder (Frost & Steketee, 1997), anorexia nervosa (Bastiani, Rao, Weltzin & Kaye, 1995) and depression (Hewitt & Flett, 1991). It does seem that perfectionism is a dispositional trait for the development of psychopathology in general, rather than for obsessive-compulsive disorder in particular. *Indecisiveness* has also been suggested to be related to obsessive-compulsive disorder (see e.g. Reed, 1985), but results are as yet inconclusive (Frost & Shows, 1993). In a study of Frost & Shows (1993) indecisiveness was found to be related perfectionism, hoarding, compulsivity and procrastination, Although it has been suggested over the years that Magical Thinking is related to obsessive-compulsive behaviour (see e.g. Saltzman, 1968), few studies have addressed this issue directly. However, Leonard, Goldberger, Rapoport, Cheslow & Swedo (1990) found obsessive-compulsive children to hold more superstitious beliefs than non-clinical groups. Further, Frost, Steketee, Cohn & Griess (1994) found that compulsive checking but not compulsive cleaning was related to Magical Thinking. *Aversion to risk taking* and *guilt* have also been found to be related to OCD (Frost, Steketee, Cohn & Griess, 1994). Finally, Purdon & Clark (1999) suggest that obsessional individuals hold dysfunctional beliefs concerning the need to control thoughts.

In recent years two other related cognitive distortions have been proposed: *Pollution of the Mind* (Rachman, 1994) and *Inferential Confusion* (O'Connor & Robillard, 1995). Pollution of the Mind has been defined as a sense of internal uncleanness, which can and usually does arise and persist regardless of the presence or absence of external, observable dirt (Rachman, 1994, p. 311). O'Connor & Robillard (1995) emphasize distorted inference processes in understanding obsessive-compulsive thoughts and behaviors. They hold that obsessive-compulsive patients are characterized by inferring the plausibility of events on the basis of several reasoning distortions, which leads the person to confuse what might be there (a probability), what is actually there (a certainty), and what is purely imaginary (a fictitious entity). A crucial aspect of the reasoning errors characterizing inferential confusion is inverse inference – an inverse type of reasoning – where the person does not start out with the senses in reaching an obsessional inference or doubt, but instead comes to infer this doubt without any actual indication of it being present or even in contradiction to what is seen or sensed. The hypothesis with respect to the importance of distorted

inference processes such as Pollution of the Mind and Inverse Inference in obsessive-compulsive symptoms has not yet been tested.

Most of the cognitive distortions and beliefs discussed above are supposed to be non-specifically related to obsessive-compulsive behaviour in general, rather than that specific domains of beliefs or cognitive processes are related to specific forms of obsessive-compulsive behaviour, i.e. washing, checking, impulsive behaviour, rumination and precision. The aim of the present study is a first attempt to examine whether specific cognitive domains are related to specific obsessive-compulsive behaviours. More specifically, one would expect that metacognitive beliefs or distortions such as Thought-Action Fusion, Inferential Confusion, and beliefs about consequences of thoughts (thought appraisal) would be related to obsessive-compulsive behaviour irrespective of the form (Wells & Papageorgiou, 1997). Further, one would expect specific patterns between Inflated Responsibility and checking on the one hand and Pollution of the Mind and washing on the other.

METHOD

Participants

A random sample of 1500 inhabitants of a city in the Northern part of the Netherlands were asked whether they were willing to participate in a questionnaire study, of whom 364 agreed to do so. Those subjects received a questionnaire booklet and 305 individuals returned the completed questionnaires: 197 females; 108 males. Their mean age was 45 years (SD=18; range=19-86).

Measures

The following measures were completed:

The Obsessive-Compulsive Beliefs-Research Inventory (OCB-RI): The Obsessive Compulsive Cognitions Working Group (OCCWG) made in 1995 an attempt to put together relevant items to assess cognitive beliefs. The initial item pool was based on 15 questionnaires available at that time

(OCCWG, 1997). This resulted in an item pool of 586 items, a priori – at face validity – classified into a number of general themes, e.g. (1) Risk Probability, (2) Responsibility, (3) Omission/Commission, (4) Thought-Action Fusion, (5) Magical Thinking, (6) Over-importance Given to Thoughts, (7) Consequences of Having the Thoughts, (8) Control, (9) Perfectionism, (10) Personal Standards, (11) Concern over Mistakes, (12) Morality/Rigidity, (13) Guilt, (14) Anxiety/Discomfort, (15) Tolerance to Uncertainty, (16) Decision Making, (17) Coping, and (18) Confidence in Memory. These items were rated by the members of the OCCWG on relevance and other characteristic, eventually resulting in a pool of 204 items.

In the present study we added items to construe scales to assess Pollution and Inferential Confusion, and did not include a scale on perfectionism, given the non-specificity of perfectionism for OCD as discussed above. Since a number of the proposed scales contained rather few items, we decided to add items that each scale contained at least ten items, which resulted in 240 items, spread over 18 scales. This item pool was rated by three laypersons on comprehensibility. If two raters agreed on the difficulty of an item this was omitted, eventually resulting in a questionnaire of 215 items.

On psychometric grounds (Cronbach's $\alpha > 0.60$) eventually the following scales were used in the further analyses: (1) Harm/Risk Probability (five items; $\alpha = 0.68$); Responsibility (six items; $\alpha = 0.70$); (3) Thought-Action Fusion (eight items; $\alpha = 0.79$); (4) Magical Thinking (13 items; $\alpha = 0.81$); (5) Over-importance Given to Thoughts (six items; $\alpha = 0.65$); (6) Consequences of Having the Thoughts six items; $\alpha = 0.72$); (7) Control (four items; $\alpha = 0.63$); (8) Personal Standards (seven items; $\alpha = 0.64$); (9) Concern over Mistakes (seven items; $\alpha = 0.80$); (10) Morality/Rigidity (six items; $\alpha = 0.61$); (11) Guilt (nine items; $\alpha = 0.74$); (12) Decision Making (six items; $\alpha = 0.71$); (13) Pollution (11 items; $\alpha = 0.79$); (14) Inverse Inference (eight items; $\alpha = 0.71$). Examples of items are given below.

- (1) Risk Probability: *The world is a dangerous place.*
- (2) Responsibility: *It is my responsibility to make sure all is well.*
- (3) Thought-Action Fusion: *Having violent thoughts is almost as unacceptable to me as violent acts.*

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- (4) Magical Thinking: *I tend to be superstitious.*
- (5) Over-importance Given to Thoughts: *If a thought repeatedly intrudes into my mind then it must have a special meaning.*
- (6) Consequences of Having the Thoughts: *I believe that if I lost control over my thoughts, I might eventually develop a psychological problem.*
- (7) Control: *I believe that having control over one's thoughts is a sign of god character.*
- (8) Personal Standards: *If I do not maintain high standards for myself then I will become careless and lazy.*
- (9) Concern over Mistakes: *When I make a mistake other people will condemn me.*
- (10) Morality/Rigidity: *Choosing between two evils is not acceptable to me.*
- (11) Guilt: *I have a lot of regrets for the things I have done.*
- (12) Decision Making: *When I have made a choice I cannot come back on it.*
- (13) Pollution: *The invisible dangers of dirt are everywhere.*
- (14) Inverse Inference: *I often know a problem exists even though I do not have visible proof of that.*

The Padua-R (Van Oppen, Hoekstra & Emmelkamp, 1995: This is an abbreviated version of the Padua-Inventory (Sanavio, 1988), which assesses obsessive-compulsive symptoms and results in five subscales: (1) washing ($\alpha = 0.76$), (2) checking ($\alpha = 0.85$) (3) impulses ($\alpha = 0.67$), (4) rumination ($\alpha = 0.86$) and (5) precision ($\alpha = 0.58$).

The Center for Epidemiological Studies-Depression Scale (CES-D, Radloff, 1977): The CES-D is recommended for assessment of depressed mood in community surveys ($\alpha = 0.90$).

Table 1. Means and standard deviations for the subscales of Padua-R and OCB-RI subscales.

Scales	Mean	SD
Impulses	2.22	2.39
Precision	3.18	2.95
Rumination	13.83	7.46
Checking	6.86	4.90
Washing	4.35	4.42
Harm/Risk	12.17	4.63
Responsibility	17.49	5.37
Thought-Action Fusion	15.76	6.85
Over-importance of Thoughts	15.98	4.91
Control over thoughts	9.44	3.69
Consequences of Thoughts	10.80	4.67
Personal Standards	22.42	5.22
Morality/Rigidity	15.85	4.77
Concern over Mistakes	18.41	6.23
Decision Making	12.97	5.13
Guilt	16.02	6.08
Inverse Inference	19.64	6.41
Magical Thinking	26.16	9.02
Pollution of the Mind.	24.78	8.57

RESULTS AND DISCUSSION

The means and standard deviations of the Padua-R subscales and the subscales of the OCB-RI are presented in table 1. Pearson correlations for the Padua-R scales and the OCB-RI are shown in table 2.

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Table 2. Correlations between cognitive domains and Padua-R sub-scales

Domains	Impulses	Washing	Checking	Rumination	Precision
Risk Probability	0.21	0.39	0.45	0.37	0.41
Responsibility	0.11	0.26	0.32	0.32	0.43
Thought-Action Fusion	0.11	0.35	0.40	0.26	0.37
Over-importance of Thoughts	0.21	0.12	0.23	0.38	0.16
Control over thoughts	0.05	0.30	0.30	0.18	0.33
Consequences of Thoughts	0.43	0.26	0.36	0.56	0.24
Personal Standards	0.12	0.34	0.28	0.30	0.44
Morality/Rigidity	0.00	0.2	0.26	0.17	0.23
Concern over Mistakes	0.28	0.30	0.39	0.46	0.40
Decision Making	0.12	0.38	0.35	0.26	0.40
Guilt	0.36	0.21	0.43	0.53	0.35
Inverse Inference	0.41	0.27	0.45	0.65	0.33
Magical Thinking	0.31	0.23	0.30	0.38	0.10
Pollution of the Mind.	0.00	0.40	0.23	0.09	0.37

Correlations > 0.25 significant at 0.05

To establish whether specific belief domains were related to specific obsessive-compulsive behaviours a number of multiple regression analyses were run, the subscales of the Padua-R inventory serving as the dependent variables. To control for depressed mood, each analysis was run twice: (i) stepwise with the OCB-RI scales as predictor variables and (ii) forward, with depressed mood (CES-D) forced as the first variable. Only variables that were correlated > 0.25 with the criterion variable were entered in the equation. Before running the multiple regression analyses we examined the intercorrelations between predictors. The magnitude of the correlations suggested that multi-collinearity was not a problem. The intercorrelations of the OCB-RI subscales and CES-D ranged from 0.06 to 0.62. Finally, in the multiple regression analyses with Rumination as criterion variable a suppressor variable occurred. Therefore, the analyses were rerun omitting

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the variables with a correlation of 0.26 with the criterion variable (i.e. Thought-Action Fusion and Decision Making).

Table 3. Results of the multiple regression analyses.

Domains	Beta	R2	t	p <
<u>Washing</u>				
Pollution	0.211	0.16	3.16	0.002
Thought-Action Fusion	0.151	0.21	2.37	0.02
Personal Standards	0.137	0.23	2.15	0.03
Harm/Risk	0.150	0.24	2.14	0.03
F (4,255)=20.30 p < 0.000				
<u>Washing Controlled for depression</u>				
Depression	0.14	0.04	2.42	0.02
Pollution	0.28	0.19	4.63	0.000
Thought-Action Fusion	0.17	0.23	2.68	0.007
Personal Standards	0.14	0.25	2.23	0.03
F (4,255)=20.72 p < 0.000				
<u>Checking</u>				
Inverse Inference	0.236	0.20	3.84	0.0002
Thought-Action Fusion	0.183	0.28	2.99	0.003
Risk Probability	0.183	0.31	2.86	0.005
Guilt	0.149	0.32	2.32	0.02
F (4,255)=30.60 p < 0.000				
<u>Checking controlled for depression</u>				
Depression	-0.091	0.05	-1.44	n.s.
Harm/Risk	0.195	0.20	3.03	0.003
Inverse Inference	0.265	0.27	4.10	0.0001
Thought-Action Fusion	0.168	0.31	2.71	0.007
Guilt	0.181	0.33	2.67	0.008
F (5,255)=25.00 p < 0.000				
<u>Rumination</u>				
Inverse Inference	0.446	0.43	8.53	0.0000
Guilt	0.223	0.50	4.27	0.0000
Consequences of Thoughts	0.205	0.52	3.69	0.0003
F (3,254)=93.37 p < 0.000				
<u>Rumination controlled for depression</u>				
Depression	0.219	0.31	4.28	0.0000
Inverse inference	0.382	0.50	7.26	0.0000
Guilt	0.168	0.50	3.22	0.002
Consequences of Thoughts	0.168	0.55	3.10	0.002
F (3,256)=79.33 p < 0.000				

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Table 3 (continued)

Domains	Beta	R2	t	p <
<u>Impulses</u>	0.234	0.18	3.35	0.0009
Consequences of Thoughts	0.226	0.23	3.44	0.0007
Inverse Inference	0.136	0.24	2.06	0.04
Guilt				
F (3,256)=27.22 p < 0.000				
<u>Impulses controlled for depression</u>	0.260	0.19	4.13	0.0001
Depression	0.221	0.26	3.44	0.0008
Consequences of Thoughts	0.167	0.28	2.06	0.01
Inverse Inference				
F (3,256)=32.73 p < 0.000				
<u>Precision</u>				
Personal Standards	0.240	0.20	3.63	0.0003
Risk Probability	0.221	0.26	3.60	0.0004
Responsibility	0.188	0.28	2.79	0.006
F (3,260)=33.30 p < 0.000				
<u>Precision controlled for depression</u>				
Depression	-0.011	0.03	-0.18	n.s.
Personal Standards	0.241	0.20	3.62	0.0004
Risk Probability	0.225	0.26	3.47	0.0006
Responsibility	0.187	0.28	2.77	0.006
F (4,259)=24.89 p < 0.000				

Results of the multiple regression analyses (table 3) reveal that obsessional beliefs are related to specific obsessive-compulsive behaviour as assessed by the Padua-Inventory-R. Interestingly, most of the results hold, even when controlled for depressed mood. If we exclude the variance explained by depressed mood, still 20% of the variance in washing, 29% of the variance in checking, 14% of the variance in rumination, 9% of the variance in impulses and 25% of the variance in precision is explained by cognitive obsessional beliefs and distortions. Actually, depression explains only a small amount of the variance in washing (4%), checking (5%) and precision (3%). In contrast, depression accounts for much more variance in impulses (19%) and in rumination (31%), but even here obsessional beliefs

and distortions explain an additional part of the variance in these obsessive-compulsive behaviours. What evidence is there that specific obsessional beliefs and distortions are related to specific obsessive-compulsive behaviour? Some general conclusions can be drawn. First, beliefs related to contamination (Pollution of the Mind) may play an important role in washing, but not in other obsessive-compulsive behaviours. Thought-Action Fusion appears to be important in washing as well as checking, but not in impulses, precision and rumination. Guilt is related to rumination and checking, but not to the other obsessive-compulsive behaviours. Further, Harm/Risk was found to be related to washing, checking and precision, but not to impulses and rumination. Inverse inference is related to checking, rumination and impulses, but not to the other obsessive-compulsive behaviours. Finally, the scale Personal Standards was only found to be related to washing and precision. Most of these relationships were expected, and the results suggest that specific cognitive domains, not not global obsessional beliefs and distortions in general, account for specific obsessive-compulsive behaviour in a meaningful way.

Further, the data suggest that some meta-cognitive beliefs and distortions are important irrespective of specific obsessive-compulsive behaviour. Inspection of table 3 shows that the meta-cognitive beliefs Inverse Inference and Thought-Action Fusion are related to all or nearly all specific obsessive-compulsive behaviours. Thus, meta-cognitive beliefs appear to play substantial role in obsessive-compulsive disorder, as is the case in worrying (Borkovec, Hazlett-Stevens & Diza, 1999), test anxiety (Matthews, Hillyard & Campbell, 1999) and hypochondrias (Bouman & Meijer, 1999).

One result deserves some specific comment. In the multiple regressions Inflated Responsibility explained only a small part of the variance in precision, and did not account for the variance in obsessive-compulsive behaviour in the other multiple regression analyses. This result is rather surprising, given the role that has been ascribed to Inflated Responsibility in explaining obsessive-compulsive behaviour in general (see e.g. Van Oppen & Arntz, 1995; Salkovskis, 1985). As noted by Lopatka & Rachman (1995) and Rachman, Thordarson, Shafran & Woody (1995) it is questionable whether Inflated Responsibility can be considered a stable personality trait or is better construed as a situational specific reaction.

Further, it should be noted that Thought-Action Fusion, which can be seen as a component of inflated responsibility (see Rachman, Thordarson, Shafran & Woody, 1995) was found to predict both washing and checking. Thus, the present results support the position of Wells & Matthews (1994) and Wells (1997) with respect to responsibility. They proposed that metacognitive beliefs concerning the danger and power of intrusive thoughts, and additional strategies used by obsessionals, are relevant in understanding the disorder. They view responsibility appraisal as an emergent property of meta-cognitive processing, and as a markers for dysfunctional beliefs about the dangers and influences of thoughts, which are the more central factors in obsessive-compulsive disorder.

Finally, a number of specific obsessional beliefs did not add to the variance explained by the obsessional beliefs discussed above. Concern over mistakes, magical thinking, rigidity/morality, decision making and control were not found to add to the variance already explained by the other cognitive domains. Although some of these specific beliefs have been found to be related to obsessive-compulsive behaviours in previous studies usually only one specific belief was investigated alone rather than the in the context of the whole domain of distorted cognitive processes as represented in the current study.

Although the results presented here are interesting, one should bear in mind that they are based on non-clinical subjects. Whether the results found here also apply to clinical samples and more specifically obsessive-compulsive patients remains to be shown. Also, the scales used in the present study have not been subjected to factor analyses, and further refining of cognitive measures is needed due to conceptual overlap between these measures (OCCWG, 1997). However, the current study provides a guideline for further research, and in particular, strongly suggest the need for further investigation of cognitive processes such as inverse inference that which were found to be related to obsessive-compulsive behaviours irrespective of the subtype.

Chapter 3

Inference Processes, Schizotypal Thinking and Obsessive-Compulsive Behaviour ¹

Abstract

Inferential confusion has been defined as confusion between what might be there (a probability), what is actually there (a certainty), and what is purely imaginary (a fictitious entity). It has been suggested that inferential confusion may be particularly relevant for obsessive-compulsive symptoms with delusional and schizotypal characteristics. Previous research has shown inferential confusion (i.e. 'inverse inference') to be related to most forms of obsessive-compulsive symptoms. The present study describes the further development and validation a questionnaire measuring inferential confusion. As well, the relationship between inference processes, schizotypal symptoms and obsessive-compulsive behavior was investigated. Results showed support for the proposed relationship of inferential confusion and schizotypal symptoms with obsessive-compulsive symptoms while controlling for neuroticism. In particular, the interaction between inferential confusion and perceptual disturbances may be particularly detrimental to the development of the OCD symptoms. The results of the present study call for further inquiry into the role of inferential confusion and schizotypal thinking in obsessive-compulsive symptoms in clinical populations.

¹ Aardema, F., Kleijer, T.M.R., Trihey, M., O'Connor, K., Emmelkamp, P. (2004) Inference processes, schizotypal thinking and obsessive-compulsive disorder. [Manuscript submitted for publication].

INTRODUCTION

Cognitive models emphasize the role of cognitive distortions and cognitive beliefs in the development and maintenance of obsessive-compulsive disorder (OCD). In most cognitive models the emphasis is on the appraisal of intrusive cognitions, since intrusive cognitions are considered 'normal'. Freeston, Rhéaume, & Ladouceur (1996) argue that according thoughts too much importance are essential elements in the development of OCD, whereas Wells (1997) and Purdon & Clark (1999) have emphasized the importance of meta-cognitive beliefs and argue that the occurrence of an obsessional thought is experienced as threatening when it triggers meta-cognitive beliefs about the meaning of thoughts in general. Several specific (meta)cognitive beliefs have been proposed to be relevant to OCD, such as Thought Action Fusion (Rachman, 1993; Rachman & Shafran, 1999) and responsibility (Salkovskis, 1985). Clark & Purdon (1993) hold that meta-cognitive beliefs about the importance of thought control and expectations that thoughts can be controlled are key factors in the etiology and maintenance of obsessive thoughts.

O'Connor & Robillard (1995, 1999) have proposed viewing obsessions as a form of belief disorder akin to a delusion or overvalued idea, based in part on the clinical overlap between OCD and Delusional Disorder (DD) (Foa, Steketee, Gayson & Doppelt, 1983; Kozak & Foa, 1994). While fixed beliefs with a strong personal investment are not uncommon in a variety of psychiatric complaints, overvalued ideation is generally located on a dimension between obsessions and delusions (Jaspers, 1913, 1963; Spitzer, Williams, Gibbons, & First, 1991). The overlap between OCD and Delusional Disorder has been a matter of debate for some time, and the nature of overvalued ideation is an important element in determining whether OCD itself is best characterized as an anxiety disorder or a schizotypal disorder (Enright & Beech, 1990; O'Dwyer & Marks, 2000). It is recognized that similarities between both disorders may only be partial in that delusional disorder has several other dimensions such as systematization of belief, lack of insight about the belief causing distress and the type of emotions typically associated with the belief (O'Connor, in press). However, traditional cognitive behavior therapy, which is aimed at altering the reactions to normal

intrusive cognitions, may not be helpful in those cases and would require a different approach.

Veale (2002), while providing a conceptual analysis of overvalued ideas, argues for a better understanding of overvalued ideas, and that an advancement in assessment is required, for this often neglected area of psychopathology, as well as novel treatments that specifically target overvalued ideas. Some advances have been made in the area of assessment for measuring overvalued ideas (Eisen, Phillips, Baer, Beer, Atala, & Rasmussen, 1998; Neziroglu, McKay, Yaryura-Tobias, Stevens, Todaro, 1999), but no instruments are presently available in the public domain that measure inference processes relevant to obsessional-compulsive symptoms beliefs (Emmelkamp & Aardema, 1999). Presently, the standard instrument for measuring cognitive factors in OCD as developed by the OCD working group is the OBQ-87 (Obsessive Compulsive Cognitions Working Group, 2001). However, none of the scales in the OBQ presently specifically focus on the issue of overlap of OCD with schizotypal symptoms.

In accordance with a belief model O'Connor & Robillard (1995, 1999) propose that intrusions are actually inferences, and formed by reasoning processes, which lead to 'inferential confusion' and this could account for obsessive-compulsive symptoms in a meaningful way in particular for those OCD clients whose core beliefs are of a more delusional nature. Inferential confusion is defined as a confusion between reality and possibility where the person acts as if an imaginary possibility is reality. Inferential confusion is the result of several reasoning errors where the person with an obsessional belief infers a state of affairs in reality (i.e. the presence of 'dirt', doors being left open) solely on the basis of subjective criteria, which reverses normal reasoning, and leads to inferring a state of affairs despite objective evidence to the contrary ("inverse inference"). For example, in normal reasoning one would infer the presence of dirt on the floor after observing muddy footprints on the floor. In contrast, the person with OCD starts out with the hypothetical possibility of dirt on the floor, while no dirt can be seen, and, despite evidence to the contrary maintains this hypothesized possibility as an actual reality. Imaginary hypothetical events, being the object of this confusion, then provoke repetitive rituals, a central

feature of obsessive-compulsive disorder. In performing a ritual, the OCD client's attempts to change an imaginary event 'as if' it was real with no chance of ever succeeding, since they are acting upon a completely fictional narrative, and so there is no reality based information which could provide the criteria for resolution of the obsessional preoccupation. The relevance of this confusion to OCD is somewhat similar to the blurring of boundaries between internal and external events in OCD patients as proposed by Wells (1997, 2000). However, whereas Wells (1997, 2000) sees this blurring of boundaries as motivated by the menacing appraisal of intrusive cognitions, O'Connor & Robillard (1995, 1999) hold that inferential confusion as a process in itself could account for the occurrence of the initial intrusion/inference (O'Connor, 2002). Similarly, inverse inference has to be distinguished from Thought Action Fusion where a person believes thoughts are morally or physically equivalent to carrying out the thought. Inverse inference on the other hand, refers to a process whereby a person confuses reality and possibility. In other words, there is a cross-over point from reality into the imagination where the person starts to rely solely on imaginary criteria to determine a state of affairs in reality. Further, this cross-over may be accompanied by schizotypal symptoms and a dissociation from reality (O'Connor & Aardema, 2003).

Since developing the clinical notion of inferential confusion, the construct has been operationalized in several experimental and psychometric studies. The initial version of the Inferential Confusion Questionnaire (ICQ) was developed as part of a research study into the relationship between cognitive domains and specific obsessive-compulsive symptoms (Emmelkamp & Aardema, 1999). In this study, inverse inference was found to be related to most forms of obsessive-compulsive symptoms while controlling for depression and other cognitive appraisal domains. As well as establishing clinical face validity for the ICQ item set, these results suggest that inferential confusion is a global meta-cognitive confusion that can account for obsessive-compulsive symptoms in general.

In experimental studies using inductive and deductive reasoning tasks, Pélissier & O'Connor (2001) reported that in OCD initial inferences based on fact are more susceptible to be influenced by self generated inductive narratives. An inductive invoked narrative drawing upon the

reasoning errors described earlier, could lead the person with OCD to doubt his or her initial inference and obsess about an unreal possibility. These experimental and questionnaire studies suggest that inferential confusion may be to different degrees a characteristic of all OCD with or without overvalued ideation. But whereas a small degree of inferential confusion may not be problematic in OCD with low obsessional conviction, it is hypothesized to constitute a major bias in OCD with high obsessional conviction levels. A cognitive therapy program specifically designed to modify OCD inductive inference biases, termed the Inference Based Approach, has proved as effective as other cognitive therapy in modifying appraisals, and more effective on a subsample with strong obsessional conviction (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Pélissier, Landry, Todorov, & Tremblay, 2003). So there is reason to assume the the presence of overvalued ideation may have implications for treatment assignment with those scoring high on inferential confusion possibly benefiting more from a therapy that specifically addresses OCD as a belief disorder (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, & Tremblay, 2003).

The present study describes the further development and validation of the ICQ. In line with O'Connor & Robillard's (1995, 1999) formulation, and previous findings from other studies with the ICQ (Emmelkamp & Aardema, 1999), it was expected that inferential confusion would be related to most obsessive-compulsive symptoms. Also, in light of the ongoing debate as to whether OCD is best conceptualized as a anxiety disorder or a belief disorder, relationships were expected to exist between schizotypal symptoms and OCD symptoms. Further, it was expected that inferential confusion would relate to schizotypal symptoms, but that these variables would nonetheless independently predict OCD symptoms. There were no hypothesis` concerning the most relevant cognitive and symptom measures in the prediction of OCD symptoms.

METHOD

Participants

A sample of 350 persons from the general population, drawn at random from the telephone directories of two towns in the west of The Netherlands, was sent an introductory letter asking them to participate in the study and a booklet containing questionnaires. 108 individuals (31%) returned the questionnaire: 41 men and 66 women, with a mean age of 46 years (SD=15.5, range 15-77). The distribution of education level was as follows: 6 % had a primary school level, 62 % a higher grade elementary or secondary school level, and 29 % a higher education level.

Measures

The following measures were completed (see table 1 for means and standard deviations):

(1) The *Inferential Confusion Questionnaire (ICQ)*. Eight items from a previous study were used (Emmelkamp & Aardema, 1999) and another 11 items were added in the present study, basing items on examples in the literature transformed from a idiosyncratic into a more general formulation, or derived from O'Connor & Robillard's (1995) definition. Following item generation, two laymen judged the clarity of formulation of the items. No items were judged to be unclear, so resulting in an initial itempool of 19 items. The 19 items of the ICQ are scored on a five-point scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.

(2) The *Padua-R* (Van Oppen et al., 1995). This is an abbreviated version of the Padua-Inventory (Sanavio, 1988) consisting of 41 items, which assesses obsessive-compulsive symptoms and results in five subscales: (1) washing ($\alpha=.86$), (2) checking ($\alpha=.88$), (3) impulses ($\alpha=.67$), (4) rumination ($\alpha=.88$), and (5) precision ($\alpha=.75$). Items are scored on a five-point scale: 0= never, 1=rarely, 2=sometimes, 3=often, 4= very often.

(3) The *4 Dimensional Personality Test (4DPT)*; Van Kampen, 1997). The 4DPT is a 64-item questionnaire developed to measure four domains of personality: (1) neuroticism, (2) extraversion, (3) insensitivity and (4) orderliness. In the present study, only the Neuroticism scale ($\alpha=.90$) was used. The scale consists of items are scored on a four-point scale: 3=YES, 2=yes, 1=no, 0=NO.

(4) The *Schizotypal Syndrome Questionnaire* (SSQ; Van Kampen, 1996; Van Kampen, submitted). This questionnaire consists of 12 scales related to schizotypal disorder. Items are scored on a four-point scale: 3=YES, 2=yes, 1=no, 0=NO. The present study used three scales of the SSQ that form a common factor “positive schizotypy”. The scale Delusional Thinking (8 items; alpha= .78) reflects magical thinking and delusional ideas revolving around delusions of reference and being influenced by outside forces (i.e. “Sometimes I have the feeling that certain thoughts of mine are from someone else” or “Sometimes I have the feeling that an article in the newspaper or a message on the radio is specifically directed to me”). The scale Perceptual Disturbances (9 items; alpha= .79) refers to disturbances in the perception of reality, a sensitivity to external stimuli, an abnormal sense of reality and symptoms of dissociation (i.e. “Sometimes, when I look at normal things like tables or chairs, they look strange” or “Now and then it seems as if parts of my body are dead or unreal”). The scale Living in an Inner World (9 items; alpha= .88) reflects a tendency to create elaborate fantasies and daydreams, and a preference for these experiences as opposed to reality (i.e. “I sometimes live totally in a world of fantasy”; “Sometimes I get so absorbed in my daydreams that I experience the outside world as disturbing”).

Table 1. Means and standard deviations

	Mean	SD
Inferential Confusion Questionnaire (ICQ)	35.2	11.5
Padua-Inventory Total	22.0	18.5
-Impulses subscale	1.6	2.4
-Washing subscale	3.9	5.0
-Checking subscale	5.5	5.2
-Rumination subscale	9.8	7.1
-Precision subscale	2.6	3.3
Neuroticism (4DPT)	33.7	11.5
Delusional Thinking (SSQ)	11.6	3.3
Perceptual Disturbances (SSQ)	10.2	2.1
Living in an inner world (SSQ)	14.4	5.2

RESULTS

Construction of the Inferential Confusion Questionnaire

In order to determine the dimensions underlying inference processes as measured by the ICQ, factor-analysis was performed on the initial itempool. Factor analyses followed by oblique rotation revealed one large first factor explaining 30.1% of the variance with an eigenvalue of 5.9. This result is consistent with current conceptualizations since the questionnaire attempted to measure a subspect of inferential confusion (i.e. `inverse inference`), which we expected to be a unidimensional construct. Inspection of the scree plot collaborated the finding that most of the variance was explained by the first factor followed by large a drop in eigenvalues (5.9 to 1.8). Therefore, we decided to extract only one factor and select items on the basis of factor loadings. Items were dropped if factor loadings were smaller than 0.40. Using this criteria a total of 4 items were removed from the itempool resulting in a final questionnaire of 15 items (see appendix for items and factorloadings).

Corrected item-total correlations ranged from .23 to .61. Coefficient alpha was computed, which showed a high internal reliability of .85. The mean total score of the ICQ was 35.2 (SD=11.5; range 15-63), with higher scores indicating distorted inference processes as formulated by O'Connor & Robillard (1995).

Interrelationships between inferential confusion, schizotypal thinking and obsessive-compulsive symptoms

The relationships between the ICQ, schizotypal symptoms and obsessive-compulsive symptoms were examined by correlational analysis. Correlations appear in table 2. As table 2 shows, the ICQ was relatively strongly related to neuroticism. This may suggest that any relationships with the other scales might be due to anxious mood. For this reason, partial correlations controlling for neuroticism were also calculated.

Table 2. Correlations and partial correlations controlled for neuroticism (between brackets) of the ICQ and SSQ subscales with related variables.

	ICQ	Delusional Thinking	Perceptual Disturbances	Living in an inner world
4DPT-Neuroticism	0.51***	0.26**	0.36***	0.19
Padua-Total	0.59*** (0.45)***	0.47*** (0.40)***	0.66*** (0.59)***	0.24* (0.18)
Padua-Impulses	0.37*** (0.20)	0.44*** (0.38)***	0.43*** (0.33)**	0.27** (0.22)*
Padua-Washing	0.45*** (0.38)***	0.39*** (0.35)**	0.49*** (0.44)***	0.17 (0.13)
Padua-Checking	0.47*** (0.36)***	0.36*** (0.30)**	0.46*** (0.38)***	0.19 (0.13)
Padua-Rumination	0.59*** (0.39)***	0.48*** (0.42)***	0.60*** (0.52)***	0.26** (0.19)
Padua-Precision	0.35*** (0.32)**	0.31** (0.28)**	0.33** (0.29)*	0.07 (0.05)
SSQ-Delusional Thinking	0.44*** (0.37)***	1.00	0.49*** (0.43)***	0.61*** (0.59)***
SSQ-Perceptual disturbances	0.42*** (0.29)*		1,00	0.35*** (0.31)*
SSQ-Living in an inner world	0.26* (0.19)			1.00

* p<.05, ** p<.01, *** p<.001

The ICQ correlated moderately to strongly with obsessive compulsive symptoms as measured by the Padua-R, and almost all correlations remained substantial while controlling for neuroticism. Some surprisingly strong correlations were found between schizotypal symptoms and obsessive-compulsive behavior. In particular, the scale perceptual disturbances showed a strong relationship with obsessive-compulsive symptoms overall as measured by the Padua-R total scale, and both Perceptual disturbances and Delusional Thinking were related to all specific obsessive-compulsive symptoms. Once again, these relationships remained

substantial while controlling for neuroticism. Correlations between the scale Living in an Inner World and scores on the Padua-R were quite small, but interestingly, significant relationships were found with the rumination scale and the impulses scale. Finally, as expected, the ICQ was significantly related to schizotypal symptoms, but correlations were moderate, so providing evidence for divergent validity between the SSQ and the ICQ.

Multiple regression analyses

In order to examine the relative contribution of inferential confusion and schizotypal symptoms to obsessive-compulsive symptoms a number of multiple regression analyses were carried out with the subscales of the Padua-R Inventory acting as dependent variables. Each analyses was run with neuroticism (4DPT subscale) forced as the first variable followed stepwise (since there were no specific hypotheses) with inferential confusion (ICQ), delusional thinking (SSQ), Perceptual Disturbances (SSQ) and Living in an Inner World (SSQ) as predictor variables. Intercorrelations between the predictor variables ranged from .26 to .61 suggesting that multicollinearity was not a problem.

Results of the multiple regression analyses show that both inferential confusion and perceptual disturbances independently explain a significant amount of variance in almost all obsessive-compulsive behaviors as measured by the Padua-R Inventory (Table 3). If we exclude the variance explained by neuroticism, perceptual disturbances and inferential confusion explain a combined 22% of the variance of the washing subscale, 18% of the variance of the checking subscale, 18% of the variance of the rumination subscale, and 13% of the variance of the precision subscale. Overall, a total of 26% of the variance of Padua-total scores are explained by perceptual disturbances and inferential confusion. Neuroticism explains only a small amount of variance for washing (6%), checking (11%) and precision (2%) subscales. In contrast, neuroticism accounts for a larger percentage of variance in the impulse (16%) and rumination (41%).

Table 3. Results of multiple regression analyses

Variables	Beta	R ²	t	p
Padua-R Total				
1) Neuroticism	0.183	0.19	2.15	0.034
2) Perceptual Disturbances	0.416	0.40	5.17	0.000
3) Inferential Confusion	0.251	0.45	2.83	0.006
F (3,104) = 27.829 p = 0.000				
Padua-Impulses				
1) Neuroticism	0.318	0.16	3.68	0.000
2) Delusional Thinking	0.330	0.26	3.82	0.000
F (2,105) = 18.473 p = 0.000				
Padua-Washing				
1) Neuroticism	0.007	0.06	0.07	0.941
2) Perceptual Disturbances	0.351	0.23	3.82	0.000
3) Inferential Confusion	0.273	0.28	2.71	0.008
F (3,104) = 13.411 p = 0.000				
Padua-Checking				
1) Neuroticism	0.097	0.11	1.53	0.314
2) Perceptual Disturbances	0.291	0.23	3.77	0.002
3) Inferential confusion	0.287	0.29	2.84	0.005
F (3,104) = 14.106 p = 0.000				
Padua-Rumination				
1) Neuroticism	0.429	0.41	5.84	0.000
2) Delusional Thinking	0.342	0.56	4.92	0.000
3) Inferential Confusion	0.213	0.59	2.78	0.008
F (3, 104)= 48.998 p = 0.000				
Padua-Precision				
Neuroticism	-0.058	0.02	-0.55	0.583
Inferential Confusion	0.274	0.11	2.50	0.014
Perceptual Disturbances	0.219	0.15	2.21	0.030
F (3,104) = 6.210 p = 0.001				

ANOVA comparison between high and low ICQ and SSQ scores

In order to further examine the independent contribution of schizotypal symptoms and inference processes to OCD symptoms one-way ANOVA was calculated between high and low scores on the subscale perceptual disturbances and the ICQ (split about the mean) and total Padua score. The ANOVA showed a significant interaction effect ($F(89,1) = 5.81$; $p = 0.018$) where individuals with high scores (greater than the mean) on *both* inferential confusion and perceptual disturbances symptoms scored more than twice as high on obsessional symptoms at a subclinical level (Padua-R Total = 44.0) than when *either* the score on inferential confusion alone (Padua-R Total = 20.8) or perceptual disturbances alone (Padua-R Total = 19.6) were elevated.

DISCUSSION

Previous studies have shown inferential confusion to be a relevant meta-cognitive confusion with unique contributions to obsessive-compulsive symptoms independent of other cognitive domains. Results have shown a good internal consistency permitting its use as a reliable instrument in research. The present results suggest that inferential confusion as measured by the ICQ is a unidimensional measure, although the ICQ items focus principally on inverse inference and subsequent dismissal of reality and objective sense information. The aim of the current study was to examine further the relationship of the ICQ and schizotypal symptoms with obsessive-compulsive symptoms in a non-clinical sample.

The ICQ showed a relatively strong relationship with neuroticism. The relationship of the ICQ with neuroticism may be due to items measuring inferential confusion under imagined threat or danger, where higher anxiety levels might be expected to be associated with higher scores. However, obsessions often signal some form of danger or threat and the ICQ is intended to measure distorted inference processes relevant to OCD that produce such danger related inferences.

As expected, inferential confusion was significantly related to obsessive-compulsive symptoms, and these results are consistent with the inference based formulation of OCD by O'Connor & Robillard (1995), and replicates earlier findings (Emmelkamp & Aardema, 1999). According to

Wells and Matthews (1994, Wells, 1997), overt and covert compulsions are aimed at reducing danger associated with intrusive cognitions or danger associated with sustained rumination. As such, the relationship of the ICQ with washing and checking compulsions could perhaps be explained if such compulsions are understood as attempts to reduce danger which is in fact imagined as a result of a confusion between imaginary and real events. This explanation seems supported by the current finding that the ICQ is significantly related to obsessive-compulsive symptom severity even when controlling for neuroticism. Overall, these results provide support for a role of inferential confusion in obsessive-compulsive behavior as suggested by O'Connor & Robillard (1995). Specifically, the relationship of the ICQ with the Padua rumination subscale may indicate inferential confusion is relevant to both obsessions with and without any overt compulsions. However, as shown in the multiple regression analysis, the strong relationship between the ICQ and the rumination subscale may be in part caused by overlap with neuroticism, and the higher N in this group.

The importance of the present study lies in establishing the link between a specific reasoning confusion in both OCD and schizotypal symptoms. Delusional thinking was found to be related to obsessive-compulsive symptoms suggesting that delusional ideas do play some role in obsessive-compulsive symptoms, which is an important element in the debate to determine whether OCD is best characterized as an anxiety disorder or a schizotypal disorder.

The role of inferential confusion and schizotypal thinking in obsessive-compulsive behavior was further explored by multiple regression analysis. Of course, multiple regression does not necessarily determine which variables are most relevant from a purely theoretical perspective, but it does establish the predictive validity of each of the variables, and whether or not independent variables account for separate variance. The results indicated that for most obsessive-compulsive symptoms both inferential confusion and perceptual disturbances independently explained a significant amount of variance in obsessive-compulsive symptoms when controlling for neuroticism. However, delusional thinking appears to be particularly relevant to obsessional impulses as measured on the PI subscale; perhaps because obsessional impulses in OCD often appear to be quite distantly related to the

actual motivations and intentions of the individual involved. The remoteness of the obsessional beliefs with respect to actual reality may be a shared characteristic with delusional beliefs. For all the other obsessive-compulsive symptoms inferential confusion and perceptual disturbances explained a significant amount of variance while controlling for neuroticism, and although inferential confusion and perceptual disturbances seem to be partly overlapping constructs as expected, they do explain a separate amount of variance in obsessive-compulsive symptoms.

The perceptual disturbances subscale was strongly related to OCD symptoms, and in the multiple regression analyses this subscale came up as a major predictor for OCD symptoms. This is rather surprising, since OCD patients do not seem to have problems with perceiving reality (Brown, Kosslyn, Breiter, Baer, & Jenike, 1994). However, other studies have found a relationship between OCD and positive schizotypal symptoms such as unusual perceptual experiences and ideas of reference (Tallis & Shafran, 1997). The high degree of absorption in obsessional scenarios, to the extent that the person experiences the obsessional concern with a “hallucinatory vividness”, has been noted by Guidano & Liotti (1983); and such a state of mind may share similarities with dissociative states of mind (Goff, Olin, Jenike, Baer, Buttolph, 1992), where the person disengages from reality into an imaginary reality. A dissociative state of mind may compromise the access to reality based information, and in combination with inverse inference, where an imagined possibility is maintained as a valid possibility, could be particularly pivotal in the maintenance of OCD symptoms, as the results of the analysis of variance appear to indicate.

The results of the present study call for further inquiry into the role of inferential confusion and schizotypal thinking in OCD. It should be kept in mind however, that even though the present study showed a relationship between inferential confusion and obsessive-compulsive symptoms, it still remains to be seen whether inferential confusion is specific to OCD. Limitations of the present study are the use of a normal subclinical population, but this is a typical step towards establishing clinical validity, since it permits recruiting in larger samples with wider variance of symptoms. Historically, such an approach has played a large role in establishing cognitions in analogue samples. However, future research needs to focus on

clinical populations, since inferential confusion has been proposed to be specifically relevant for those with obsessive-compulsive disorder.

A further limitation of the current study is the low response rate. Nevertheless, the response rate in this study is comparable to response rates of other mail surveys (see e.g. Luteijn, Arrindell, Huiskes, Kits, Lenters & Sanderman 1993; de Jong, Timmerman & Emmelkamp, 1996; Rijsoort, Emmelkamp & Vervaeke, 1999), and as noted by Rijsoort et al. (1999), that while the representativeness of samples with response rates commonly found in mail surveys can be questioned, it allows for testing questionnaires in a community sample as opposed to often-used student samples. Therefore, the current validation provides a psychometric basis for further validation of the ICQ in clinical populations.

In conclusion, the results of the present study confirmed the validity and reliability of the ICQ in a subclinical population and showed a positive relationship between inferential confusion and OCD symptoms. These relationships continued to be significant while controlling for neuroticism. Further, a systematic relationship and positive relationship was found between schizotypal symptoms and OCD, that is consistent with cognitive formulations of OCD as a belief disorder. In particular, inferential confusion and perceptual disturbances independently explain a significant amount of variance in OCD symptoms, and their interaction may be particularly detrimental in the maintenance of OCD symptoms. These findings have implications for the treatment of OCD where the use of cognitive techniques specifically targeting the initial obsessional belief may be indicated in a subgroup of OCD clients. Further innovation in assessment is required to identify individuals with schizotypal and delusional-like symptoms who may benefit from such an approach. Future studies to enhance the utility of the ICQ include its validation in clinical populations, detection of clinical change over treatment and the evaluation of innovative treatments that specifically target OCD with schizotypal symptoms.

Chapter 4

Inferential Confusion as a Construct in Obsessive-Compulsive Disorder¹

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 imaginary reality with an actual reality. 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 (ICQ), 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.

¹ Reprinted from Behaviour Research and Therapy, 43, Aardema, F., O'Connor K., Emmelkamp, P, & Todorov, C. (2005), with permission from Elsevier. Inferential confusion and obsessive-compulsive disorder: The Inferential Confusion Questionnaire..

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 & DeSilva, 1978, Salkovskis & Harisson, 1984), although it is not entirely clear how appraisal translates normal intrusions into abnormal obsessions (Jakes, 1996; Taylor, 2002), 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, pg. 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, Gibbons, & 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, 2003; O'Dwyer & Marks, 2000; Lysaker, Marks, Picone, Rollins, Fastenau, & Bond, 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, Aardema, Bouthillier, Fournier, Guay, Robillard, Pélissier, Landry, Todorov, & Tremblay, 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 an hypothesis (i.e. the presence of dirt) despite evidence to the contrary. In contrast, normal inference would start with observing a state of affairs (i.e. seeing dirt on the floor), and then coming to a conclusion that therefore, for example, dirt 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, 1996; 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 & Safran, 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). 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 predecessor 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, 2003). 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.

METHOD

Recruitment and participants

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, Di Nardo, & Barlow, 1994; Y-BOCS; Goodman, Price, Rasmussen, Mazure, Delgado, Heniger, & Charney, 1989; Goodman, Price, Rasmussen, Mazure, Fleischman, Hill, Heniger, & Charney, 1989). 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 cohabitating, 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.

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, Di Nardo, &, 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, and 9.6% separated or divorced.

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, Buchanan, Reed, Cutting, Everitt, Garety, Taylor, 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, and 6% were divorced.

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, Bland, Canino, Greenwald, Hwu, Lee, Newman, Oakley-Browne, Rubio-Stipec, Wickramarathe, Wittchen, Yeh, 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 cohabitating, and 13.5 % separated or divorced.

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.

Measures

All participants in the OCD group were administered the following questionnaires:

The Inferential Confusion Questionnaire (Aardema, Kleijer, Trihey, O'Connor & Emmelkamp, 2003). 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 ($\alpha = .85$) of the ICQ-15 are scored on a five-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, Formea, & 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). Items are rated on a 5-point scale (0=not at all typical to 5= very typical) The PI-WSUR 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 ($\alpha = .95$) and the subscales are reliable ($\alpha = .75-.91$).

The Obsessive Beliefs Questionnaire (OBQ-87; Obsessive Compulsive Cognitions Working Group, 2001). 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; $\alpha = .89$), Overestimation of Threat (14 items; $\alpha = .91$), Tolerance for Uncertainty (13 items; $\alpha = .0.88$), Importance of Thoughts (14 items; $\alpha = 0.91$), Control of Thoughts (14 items; $\alpha = .92$) and Perfectionism (16 items; $\alpha = .93$). Initial validation studies indicate excellent reliability for each subscale ($\alpha = .82-.91$) and evidence of convergent and construct validity (OCCWG, 2003).

The *Thought Action Fusion Scale* (TAF; Shafran, Thordarson, Rachman, 1996; Translated 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 to 0.96).

The *Beck Anxiety Inventory* (Beck, Epstein, Brown, & Steer, 1988) is a 21-item anxiety symptom checklist rating symptom intensity for the last week on a 0-3 scale ($\alpha = .91$).

The *Beck Depression Inventory* (Beck, Steer, & Garbin, 1988) is a 21-item measure of depressive symptoms for the last week on a 0-3 scale ($\alpha = .91$).

RESULTS

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, & 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.

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

	M	SD
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

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

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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

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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 .90. The average item-total correlation was 0.65 with a range of 0.38 to 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.

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).

Table 3. Differences between groups on the Inferential Confusion Questionnaire (ICQ) and Padua Revised ^a.

	1. OCD (n=85)		2. DD (n=16)		3. AC (n=30)		4. NCC (n=51)		post hoc comparisons (p< 0.05)
	M	SD	M	SD	M	SD	M	SD	
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
Thoughts about harm	10.9	6.1	7.5	5.7	6.7	6.0	2.0	2.1	1 > 2,3 > 4
Impulses about Harm	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
Dressing/ Grooming	5.6	4.0	2.5	2.5	1.2	2.0	1.4	2.6	1 > 2,3,4

^a OCD= Obsessive-Compulsive Disorder Group; DD= Delusional Disorder Group; AC= Anxious Control Group; NCC= Non-Clinical Control Group.

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 ($F(3, 175)= 16.46$; $p=0.000$), 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.

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

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distinguished from anxiety and depression. Zero-order correlations in the different groups are shown in table 4.

Table 4. Correlations between the Inferential Confusion Questionnaire (ICQ) and symptoms measures in the different groups ^a

	OCD (n=85)	DD (n=16)	AC (n=31)	NCC (n=51)
	ICQ	ICQ	ICQ	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

^a * P < 0.05, ** P < 0.01, *** P < 0.001. OCD= Obsessive-Compulsive Disorder Group; DD= Delusional Disorder Group; AC= Anxious Control Group; NCC= Non-Clinical Control Group

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. 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.

Inferential confusion and other cognitive measures

The identification of OCD relevant cognitive beliefs is complicated by high intercorrelations among OCD-related cognitive domains (OCCWG, 2001, 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 quite strongly related to the OBQ belief domains overestimation of threat ($r=0.72$; $p < 0.001$) and responsibility ($r=0.60$; $p < 0.001$). However, inferential confusion could be more adequately distinguished from 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,

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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.

Table 5. Partial correlations between the Inferential Confusion Questionnaire and Padua-Revised controlled for OBQ domains (n=85)^a

	Inferential Confusion Questionnaire						
	Contr. for all	Contr. for THR	Contr. for RES	Contr. for IMP	Contr. for CER	Contr. for CON	Contr. 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	0.15	0.04	0.16	0.13	0.04	0.06	0.09

^a p < 0.05, ** p < 0.01, *** p < 0.001. THR= Overestimation of threat, RES= Responsibility, IMP= Overimportance given to thoughts, CER= Intolerance to uncertainty, CON= Control of thoughts, PER= Perfectionism.

As can be seen in table 2 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, which 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 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 ($r=0.22$; $p = 0.06$).

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 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, 2003). In this regard, it is interesting to note the high Padua scores in the DD sample despite this group clinically 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 bias rather than obsessional concerns and we are exploring this possibility.

An investigation of OCD from a non-phobic point of view does of course not detract from the role of OBQ belief domains in OCD. Recently, it

has been suggested that an inference based approach may perhaps complement the appraisal model. Clark & 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 & 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 other obsessive-compulsive symptoms 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, 2003). 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 overall 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 (O'Connor & Aardema, 2003; O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Pélissier, Landry, Todorov, & Tremblay, 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.

Chapter 5

Are Obsessive-Compulsive Beliefs Epiphenomena of Inferential Confusion?¹

Abstract

The current study an extension of the study described in chapter 4 containing additional analyses in a sample of 85 OCD patients on the construct of inferential confusion (e.g. Aardema, O'Connor, Emmelkamp, Marchand & Todorov; in press). The goal was to establish whether inferential confusion could account for most of the relationships between obsessional beliefs and obsessive-compulsive symptoms in an OCD sample. Results showed that inferential confusion accounts for almost all of the variance between obsessive-compulsive beliefs and symptoms. A competing hypothesis for the results was investigated, because of the overlap between inferential confusion and overestimation of threat. Results indicated that inferential confusion is factorially distinct from overestimation of threat, and that the independent construct of inferential confusion remains significantly related to obsessive-compulsive symptoms when controlling for anxious mood. These results are consistent with our contention that specific obsessive-compulsive beliefs may be largely an epiphenomena of inferential confusion.

¹ Aardema, F., O'Connor, K. & Emmelkamp, P.M.G (2004). Are Obsessive-Compulsive Beliefs Epiphenomena of Inferential Confusion? [Manuscript submitted for publication].

INTRODUCTION

Contemporary cognitive models of obsessive-compulsive disorder (OCD) tend to focus on specific beliefs and appraisals in the development and maintenance of this disorder. Beck's model of psychopathology was fruitfully applied to OCD in the work of Rachman (1997) and Salkovkis (1985, 1989) who hold that it is not the unwanted intrusive cognition that leads to distress and compulsive behaviours, but instead, how the person appraises these thoughts in terms of personal significance or responsibility. Thus, the main effort of these appraisal models of OCD has been to identify specific obsessive-compulsive beliefs relevant to OCD (see Taylor, 2002). However, equally important, may be the *form* and *context* of obsessions and particular reasoning processes associated with the occurrence of obsessions that go beyond cognitive content considerations (O'Connor, 2002; O'Connor, Aardema & Pélissier, 2004).

Recognition of the idiosyncratic content of cognitive variables in OCD has led some to suggest that more idiosyncratic measures may be needed to assess cognitive characteristics in OCD, since current measures of obsessive beliefs like the OBQ (OCCWG, 2003) may reflect mood states rather than deeper cognitive structures (Emmelkamp, 2002). However, the difficulty with identifying specific obsessional beliefs may be intrinsic to the phenomenology of obsessive-compulsive disorder in that there are *no* general schema, specific beliefs or even thoughts that cause this disorder, but rather patterns in reasoning that may revolve around any type of mental content or belief. An inference based approach to OCD (Aardema & O'Connor, 2003; O'Connor & Robillard, 1995, 1999) rather than identifying *specific* mental content locates specific reasoning devices in idiosyncratic narratives that form the justification behind a particular obsessional doubt or inference. In particular, these idiosyncratic narratives are characterized by a *distrust of the senses* and *inverse inference* - an inverse type of reasoning where the person does not start out with the senses in reaching an obsessional inference or doubt, but instead, comes to infer this doubt without any actual indication of it being present or even in contradiction to what is seen or sensed. As such, an inference based approach would attribute no causal role to specific obsessive-compulsive beliefs and appraisals in the development and maintenance of OCD that occur in the aftermath of obsessional doubt.

Several studies have found support for a role of inferential confusion in OCD above and beyond that already explained by cognitive belief domains (Aardema, O'Connor, Emmelkamp, Marchand & Todorov; in press; Emmelkamp & Aardema, 1999). However, an inference based approach would also consider obsessive-compulsive beliefs and appraisals as perhaps more reflective of the particular way the person deals with obsessions instead of representing crucial factors in the development of OCD. In fact, it has been suggested that some obsessive-compulsive beliefs and appraisals are largely epiphenomena of inferential confusion, in that they follow logically and naturally from the intensity and reality value of the primary obsessional inference (Aardema & O'Connor, 2002). In other words, inferential confusion may be a process that contributes to the development of obsessive-compulsive beliefs, but these beliefs do not represent causal factors in the development of OCD.

The aim of the present study was to establish whether inferential confusion could account for most of the relationships between obsessional beliefs and obsessive-compulsive symptoms. In line with our theoretical formulation we expected that most of the relationships between belief domains and obsessive-compulsive symptoms could be explained by inferential confusion as a process operating independently from specific beliefs and appraisals, and that inferential confusion, would explain the relationship between obsessive-compulsive beliefs and symptoms. In addition, we also addressed a competing hypothesis inspired by the overlap between inferential confusion and overestimation of threat, which would argue that it is not inferential confusion which accounts for the relationship between obsessive-compulsive beliefs and symptoms, but overestimation of threat.

METHOD

Recruitment and participants

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 face-to-face diagnostic interview, and administration of a semi-structured interview (ADIS-IV, Brown, Di Nardo, & Barlow, 1994; Y-BOCS; Goodman, Price,

Rasmussen, Mazure, Delgado, Heniger, & Charney, 1989; Goodman, Price, Rasmussen, Mazure, Fleischman, Hill, Heniger, & Charney, 1989). 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). For a more detailed description of the recruitment procedure see Aardema, O'Connor, Emmelkamp, Marchand & Todorov (in press).

The total sample consisted of 85 participants (54 female, 31 male). The average age for the entire group was 37.6 years (SD=11.9; range 17-59). Education level was distributed as follows: 23.8% secondary education, 31.7% college education, and 40% university education. The marital status of participants was a percentage of 43.5% single, 28.6% married or cohabitating, and 12.7% separated or divorced.

2.2. Measures

All participants in the OCD group were administered the following questionnaires:

The Inferential Confusion Questionnaire (ICQ; Aardema, O'Connor, Emmelkamp, Todorov, 2004). This questionnaire measures several key aspects of inferential confusion as formulated by O'Connor & Robillard (1995). Items reflect a tendency to distrust the senses and inverse inference, where the person infers a state of affairs in reality without any actual indication of it being present or even in contradiction to what is seen or sensed. The 15 items ($\alpha = .85$) of the ICQ-15 are scored on a five-point scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.

The Padua Inventory Washington University Revision (PI-WSUR; Burns, Keortge, Formea, & 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). Items are rated on a 5-point scale (0=not at all typical to 5= very typical) The PI-WSUR measures content dimensions relevant to OCD: 1) Obsessional thoughts (7 items), 2) Contamination (10 items), 3) Checking (10 items), 4) Dressing/grooming (3

items) and, 5) Obsessional impulses (9 items). The total scale ($\alpha = .95$) and the subscales are reliable ($\alpha = .75-.91$).

The *Obsessive Beliefs Questionnaire* (OBQ-44; Obsessive Compulsive Cognitions Working Group, in press). This instrument has been developed collaboratively by the Obsessive Compulsive Working Group. The OBQ-44 is a shortened version of the OBQ-87 (Obsessive Compulsive Cognitions Working Group, 2003) whose scales have been derived through factor-analyses as opposed to the rationalistic generated scales of the OBQ-87. It consists of three scales, namely 1) Responsibility/Overestimation of Threat, 2) Tolerance for Uncertainty/Perfectionism and 3) Importance of Thoughts/ Control of Thoughts

The *Beck Anxiety Inventory* (Beck, Epstein, Brown, & Steer, 1988) is a 21-item anxiety symptom checklist rating symptom intensity for the last week on a 0-3 scale ($\alpha = .91$).

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

Table 1. Means and standard deviations of the ICQ, OBQ-44 and symptom measures (n=85).

	M	SD
ICQ	49.1	12.0
OBQ44-Total	188.4	53.8
- <i>Responsibility/Overestimation of Threat</i>	66.8	25.0
- <i>Tolerance for Uncertainty/Perfectionism</i>	78.2	20.8
- <i>Importance of Thoughts/ Control of Thoughts</i>	43.4	17.1
Padua Revised-Total Score	63.2	24.0
_ <i>Thoughts about harm</i>	10.7	6.1
- <i>Impulses about harm</i>	3.5	4.8
- <i>Contamination</i>	18.0	11.1
- <i>Checking</i>	21.4	9.5
- <i>Dressing/grooming</i>	5.7	4.0
Beck Anxiety Inventory	20.3	13.2

RESULTS

Independent relationships of the ICQ and OBQ with obsessive-compulsive symptoms.

The main purpose of the present study was to establish whether inferential confusion could account for the relationship between OBQ-44 belief domains and obsessive-compulsive symptoms. For this purpose, we calculated zero-order and partial correlations (controlled for inferential confusion) between the OBQ belief domains and obsessive-compulsive symptoms. Zero-order and partial correlations between OBQ-44 belief domains and obsessive-compulsive symptoms have been reported in table 2.

Table 2. Zero-order correlations and partial correlations OBQ belief domains with obsessive-compulsive symptoms (n=85).

	OBQ44-T	RT	PC	ICT
PI-R Total				
-Zero-Order Correlations	0.48***	0.47***	0.39**	0.34*
-Controlled for ICQ	0.18	0.06	0.27*	0.09
PI-R Obsessions				
-Zero-Order Correlations	0.57***	0.61***	0.32**	0.50***
-Controlled for ICQ	0.24*	0.20	0.10	0.33*
PI-R Impulses				
-Zero-Order Correlations	0.25*	0.19	0.18	0.29*
-Controlled for ICQ	0.11	-0.02	0.10	0.20
PI-R Checking				
-Zero-Order Correlations	0.32**	0.34**	0.34**	0.10
-Controlled for ICQ	0.03	0.06	0.26*	-0.16
PI-R Contamination				
-Zero-Order Correlations	0.28*	0.28*	0.22*	0.21
--Controlled for ICQ	0.01	-0.07	0.08	0.01
PI-R Dressing				
-Zero-Order Correlations	0.19	0.11	0.29**	0.08
-Controlled for ICQ	-0.09	-0.20	0.19	-0.03

p<.05, ** p<.01, *** p<.001. OBQ44-T= Obsessional Beliefs Questionnaire-44 Total Score; RT= Responsibility/Threat; PC = Perfectionism/Intolerance to uncertainty; ICT= Importance give to thoughts/Control of thoughts; ICQ=Inferential Confusion Questionnaire; PI-R= Padua Inventory Revised.

The results largely confirmed our expectations that inferential confusion can account for the relationship between OCD beliefs and obsessive-compulsive symptoms overall. While zero-order correlations of the OBQ beliefs with obsessive-compulsive symptoms are substantial, these relationships decrease considerably when controlling for inferential confusion. Only the scale Perfectionism/Certainty remains significantly related to obsessive-compulsive symptoms overall, in particular checking compulsions, whereas the subscale Importance/Control of thoughts remains significantly related to obsessions about harm. In general, the decrease in strength of relationships between OBQ beliefs and obsessive-compulsive symptoms is quite dramatic.

3.2. Competing hypothesis for the current results

Inferential confusion as measured by the ICQ has an overlap with the construct of overestimation of threat (Aardema, O'Connor, Emmelkamp, Todorov, 2004). Thus, it could be argued that some of the results in the present study are attenuated by the overlap between the ICQ and overestimation of threat. It appears likely that the construct of overestimation of threat is also associated with other belief domains and may account for the relationship of Perfectionism/Certainty and Importance/Control of Thoughts with obsessive-compulsive symptoms. Indeed, partial correlations between these subscales and the Padua revised total score while controlling for Threat/Responsibility are respectively 0.19 ($p=0.08$) and 0.03 ($p=0.76$). Similarly, an overlap between overestimation of threat and inferential confusion overlap may have affected the relationships between belief domains and obsessive-compulsive symptoms when controlling for inferential confusion, since controlling for inferential confusion may have meant controlling for overestimation of threat as well. We set out to investigate this possibility by first investigating whether the item set of the ICQ could be empirically distinguished from threat through factor analyses.

We performed a principal component analyses on the items of the ICQ and the original OBQ-87 subscale overestimation of threat, followed by varimax rotation in order to extract two independent factors. Results indicated one large first factor with an eigenvalue of 11.0 explaining 38.0% of the variance, followed by a second factor with an eigenvalue 2.3

Inferential confusion and obsessive-compulsive beliefs

explaining an additional 7.9% of variance. Factorloadings on both factors after varimax rotation are shown in table 3.

Table 3. Factorloadings after varimax rotation with abbreviated item content.

		Factor 1	Factor 2
ICQ9	There are many invisible dangers	0.73	0.01
ICQ8	Even without proof my imagination convinces me otherwise	0.71	0.25
ICQ12	Imagination makes me loose confidence in what perceive	0.66	0.30
ICQ11	Knowing a problem exists without visible proof	0.65	0.17
ICQ10	Just a thought is enough proof for danger	0.65	0.38
ICQ1	More convinced about what might be than what is seen	0.64	0.21
ICQ15	Reacting to something that might be as if it is happening	0.64	0.33
ICQ2	Inventing dangers that might be without seeing	0.58	0.29
ICQ7	Idea of danger without obvious reason	0.58	0.29
ICQ13	In spite of evidence feeling that danger will occur	0.57	0.30
ICQ6	Something not safe, because things are not as they appear	0.56	0.24
ICQ14	More afraid of unseen than seen	0.56	0.02
ICQ3	Knowing there`s danger without feeling need to look	0.53	0.08
ICQ4	One can never know something is safe on appearances	0.43	0.17
ICQ5	Thinking there is danger and immediately taking precautions	0.28	0.57
OBQ82	When things go wrong it`s like to have terrible effects	0.09	0.81
OBQ40	Small things turn into big problems in my life	0.02	0.69
OBQ50	Not taking precautions increases the risk of an accident	0.33	0.69
OBQ80	When things go well, something bad will follow	0.09	0.81
OBQ61	I`m more likely than others to cause harm	0.03	0.67

Inferential confusion and obsessive-compulsive beliefs

Table 3 (continued). Factorloadings after varimax rotation with abbreviated item content.

OBQ79	Ordinary experiences in my life are full of risk	0.42	0.65
OBQ16	Minor annoyances seem like disasters to me	0.16	0.64
OBQ30	Bad things are more likely to happen to me than others	0.28	0.63
OBQ72	Harmful events will happen unless I'm careful	0.35	0.58
OBQ68	Even when I'm careful, I often think bad things will happen	0.46	0.53
OBQ9	I am more likely to be punished than others	0.33	0.48
OBQ6	I think things around me are unsafe	0.52	0.45
OBQ39	Avoiding serious problems requires constant effort	0.56	0.45
OBQ52	I believe the world is a dangerous place	0.41	0.22

As can be seen table 3 the first factor mostly contain high loadings from the items of the ICQ, whereas the items of the overestimation of threat scale have most of their highest loadings on the second factor. Only one item of the ICQ loads on the construct of overestimation of threat, and only three items from the overestimation of threat scale load on the construct of inferential confusion. However, in order to determine whether the varimax rotation was truly reflective of the underlying factor structure we also performed an oblique rotation. This resulted in very similar findings with only two items of the inferential confusion questionnaire having their highest loading on a second factor representing the construct of overestimation of threat, and none of the items of the overestimation of threat subscale having their highest loading on the first factor representing the construct of inferential confusion. Thus, these results show that the construct of inferential confusion can be clearly separated from overestimation of threat through factor analyses. Moreover, both factors that came about through varimax rotation are uncorrelated, and so we are in a position to establish whether or not the ability of the ICQ to account for the relationships between OBQ belief domains and obsessive-compulsive symptoms may have been attenuated by a psychometric overlap with overestimation of threat

We calculated the correlations of each of the independent factors (using factor-scores) with obsessive-compulsive symptoms, and both overestimation of threat and inferential confusion were found to be

independently related to obsessive-compulsive symptoms. The construct of inferential confusion was independently significantly related to the Padua Revised total score ($r=0.41$; $p < 0.001$), obsessions about harm ($r=0.60$; $p < 0.001$) and washing compulsions ($r=0.39$; $p < 0.001$). No significant relationships were found with the other subscales of the Padua Revised. The construct of overestimation of threat was independently significantly related to the Padua Revised total score ($r=0.44$; $p < 0.001$), obsessions about harm ($r=0.47$; $p < 0.001$), obsessional impulses ($r=0.24$; $p = 0.03$) and checking compulsions ($r=0.39$; $p < 0.001$). No significant relationships were found with the other subscales of the Padua Revised.

These results appear to indicate that the ability of inferential confusion to account for the relationships between OBQ belief domains and obsessive-compulsive symptoms may in part have been caused by its overlap with overestimation of threat. However, it can be questioned whether this second factor actually represents overestimation of threat. Overestimation of threat is often considered to be a general vulnerability factor in anxiety disorders, and as such, this factor may be more representative of anxious mood rather than form a particular cognitive bias. In order to test for this hypothesis we calculated the relationship between overestimation of threat (using factor-scores) and obsessive-compulsive symptoms while controlling for anxious mood (BAI). Results of these analyses showed that the construct of overestimation of threat only remained significantly related to checking compulsions ($r=0.27$; $p=0.02$), while no significant relationships remained with any of the other obsessive-compulsive symptoms. In contrast, the construct of inferential confusion remained significantly related with obsessive-compulsive symptoms overall ($r=0.26$; $p=0.03$), obsessions about harm ($r=0.48$; $p < 0.001$) and washing compulsions ($r=0.26$; $p=0.03$) when controlling for anxious mood. Therefore, a competing hypothesis that holds overestimation of threat may be responsible for the ability of inferential confusion to account for the relationship between beliefs and obsessive-compulsive symptoms is put into doubt.

4. DISCUSSION

The main goal of the present study was to establish whether the relationship between obsessive-compulsive beliefs and symptoms could be

explained by inferential confusion. Results indicated that inferential confusion accounted for most of the relationships between obsessive-compulsive beliefs and obsessive-compulsive symptoms. These results are consistent with our contention that obsessive-compulsive beliefs follow logically from the processes associated with the occurrence of obsessions, and may be more reflective of the particular way the person deals with these obsessive-compulsive symptoms rather than representing crucial factors in the development of OCD.

A competing hypothesis was explored which imputed the current results to the overlap between inferential confusion and overestimation of threat. However, after separating the variance shared of both constructs with obsessive-compulsive symptoms, and controlling for anxious mood, inferential confusion was significantly related to several obsessive-compulsive symptoms, while most of the relationships between overestimation of threat and obsessive-compulsive symptoms disappeared. In other words, overestimation of threat was found not to be a viable competing hypothesis for the current results.

However, multidimensional studies attempting to establish the unique variance shared between cognitive measures and obsessive-compulsive symptoms remain a challenge, since partial correlations cannot completely eliminate all competing hypotheses. In particular, further research is needed to determine the relative contribution of inferential confusion and anxious mood in explaining the relationships between obsessive-compulsive beliefs and obsessive-compulsive symptoms. Also, it seems likely that cognitive elaboration on intrusions or obsessions at least to some extent reinforces obsessive-compulsive symptoms. For example, Rachman (2003) has recently drawn attention to the role of appraisals in generating fearful contexts for the obsession to occur. However, the current results suggest that reasoning errors associated with the occurrence of obsessions, may be more critical factors in the development of OCD than beliefs and appraisals.

Chapter 6

Inferential Confusion, Cognitive Change and Treatment Outcome¹

Abstract

The current study investigates whether inferential confusion is associated with treatment outcome in a sample receiving cognitive behavioral therapy (CBT). Inferential confusion has been defined as a confusion between reality and possibility where the person with Obsessive-Compulsive Disorder (OCD) persists in his/her obsessional belief despite sense information to the contrary. Results indicated that changes in inferential confusion as measured by the Inferential Confusion Questionnaire (ICQ) were significantly associated with treatment outcome. In addition, results indicated that inferential confusion shows differential validity as a cognitive marker in OCD specifically associated with change in obsessive-compulsive symptoms during treatment, rather than representing a general outcome variable for successful therapy. Results are discussed in terms of the importance of the concept of inferential confusion for obsessive-compulsive disorder with and without schizotypal characteristics.

¹ Aardema, F., Emmelkamp, P., O'Connor, K (2005).. Inferential confusion, cognitive change and treatment outcome. [Manuscript accepted for publication]. Clinical Psychology and Psychotherapy. © John Wiley and sons Ltd. Reproduced with permission.

INTRODUCTION

In recent years, the concept of inferential confusion has been proposed as a cognitive factor contributing to the development and maintenance of OCD (Aardema & O'Connor, 2003; O'Connor & Robillard, 1995, 1999). Inferential confusion has been defined as a confusion between reality and possibility where the person treats the obsession as a valid probability rather than recognizing the obsession as an imagined possibility. A crucial aspect of inferential confusion is a distrust of the senses, and a reverse type of reasoning, where the person comes to infer a possible state of affairs in reality despite the presence of sense information to the contrary. For example, the person with OCD sees and knows the door is closed yet continues to persist in the possibility that the door is not closed. These inferences of possibility ("I might have left the door unlocked"; "I might be contaminated") take on obsessional characteristics, because in OCD patients they have come about on the basis of a purely subjective rationale, which attenuates the incorporation of sense information to disengage from the obsession and associated compulsive behaviours. For example, a person who washes his/her hands, not on the basis of seeing dirt, will have difficulty deciding whether his/her hands are clean even after repeated washing.

Several studies have shown inferential confusion to be related to most forms of obsessive-compulsive symptoms. A study by Emmelkamp & Aardema (1999) found inferential confusion to be independently related to most forms of obsessive-compulsive symptoms while controlling for depression and 13 other cognitive domains. Similar relationships were found in another study that found a relationship with most obsessive compulsive symptoms while controlling for neuroticism (Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004). In two recent studies with an OCD sample inferential confusion independently added to the prediction of obsessive-compulsive symptoms beyond the variance already explained by obsessive-compulsive beliefs, and also accounted for the major part of the variance between between obsessive-compulsive beliefs and obsessive-compulsive symptoms (Aardema & O'Connor, Emmelkamp Marchand, Todorov, 2004; Aardema, O'Connor, Emmelkamp, 2004). These studies have highlighted

the importance of an investigating the reasoning processes in OCD that are associated with the occurrence of obsessions.

An inference based approach primarily conceptualizes OCD as a belief disorder, and as such, emphasizes non-phobic elements in the development and maintenance of this disorder (O'Connor & Robillard, 1995). Rather than locating the origin of obsessions in intrusions, it conceptualizes obsessions as primary inferences ("The cooker might be let on"; "I may have been contaminated"). These inferences come about as the result of prior reasoning. In this model, there is no such phenomenon as an intrusion; rather there is an initial perception of a real event or object, followed by an inference about a related state of affairs, which in turn forms the conditional premise (if X then...) for a series of secondary deductions about consequences and how such consequences will be appraised and interpreted. The formulation of the primary inference represents the first step in the inferential confusion process where an imaginary possibility becomes taken as a genuine likelihood (O'Connor & Robillard, 1999). The initial doubt (ex.: "maybe I am contaminated") is maintained by an idiosyncratic reasoning process which invests meaning in the initial thought (primary inference), and subsequently spirals off to secondary aversive consequences (secondary inferences) leading to appraisals of the obsessional thoughts (this is terrible to have such thoughts) and perhaps further coping appraisals (I can't deal with this problem, I'm out of control).

Since the concept of inferential confusion primarily deals with the imaginary nature of obsessions it would be expected to be particularly relevant to OCD with delusional or schizotypal characteristics. Indeed, inferential confusion is associated with schizotypal symptoms (Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004), and those with delusional disorder have been found to score as high on inferential confusion as those with OCD (Aardema & O'Connor, Emmelkamp Marchand, Todorov, 2004). The overlap between OCD and schizotypy have led some to suggest that OCD can better be characterized as a schizotypal disorder than an anxiety disorder (Enright & Beech, 1990). In particular, psychotic-like symptoms such as fixity of belief, perceptual aberration and magical ideation are present in some subgroups of OCD patients, and these types of symptoms have been found to be associated with poor treatment outcome (Jenike, Baer, Minichiellom, Schwartz & Carey, 1986. Eisen & Rasmussen, 1993,

Foa, 1979, Foa, Abromowitz, Franklin, & Kozak, 1999); Moritz, Fricke, Jacobson, Kloss, Wein, Rufer, Katenkamp, Farhumand, & Han, 2003). However, while research findings appear to indicate at least some schizotypal symptoms do play a role in obsessive-compulsive disorder, there is currently no coherent conceptualization as to the exact nature of the relationship between schizotypal symptoms and OCD. In terms of the inferential confusion process, however, these psychotic-like symptoms can be viewed as the far end of the inferential confusion dimension which signifies a cross-over point leading from reality into the imagination, and where the obsessional inference becomes a 'lived in' reality (O'Connor & Aardema, 2003; O'Connor & Aardema, 2004). Indeed, where both level of inferential confusion and perceptual disturbances is high, obsessive-compulsive symptoms seem to be more severe (Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004).

However, it is as yet unclear whether inferential confusion constitutes a reasoning bias that is primarily associated with OCD with schizotypal characteristics or whether it represents a general reasoning bias in OCD as psychometric findings appear to indicate (Emmelkamp & Aardema, 1999; Aardema, O'Connor, Emmelkamp, Marchand, & Todorov, 2004). Regardless of the exact nature of the relationship of inferential confusion with schizotypal or psychotic-like characteristics in OCD, cognitive-behavioural treatment specifically targeting inferential confusion has been found to be more effective than conventional CBT for those with stronger obsessional conviction (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre, 2004). In particular, those who showed a strong conviction level on an idiosyncratic measure of obsessions benefited more from an inference based approach (IBA) than those who showed lower conviction levels. However, this study did not include a measure of inferential confusion, and results remain tentative as to whether inferential confusion is an active cognitive ingredient in therapy associated with treatment outcome for obsessive-compulsive disorder in general.

The importance of the cognitive element in treatment programs for OCD remains contentious. Treatment studies based on (meta)-cognitive models seem to offer effective treatment, but it is unclear whether cognitive change precedes or follows improvement in symptoms (Rheaume &

Ladouceur, 2000). Some have suggested that current measures of cognitions may reflect change in mood states rather than change in cognitive beliefs, and that the importance of cognitive change in these beliefs in treatment is far from conclusive (Emmelkamp, 2002). For example, a treatment outcome study carried out by Emmelkamp, Van Oppen & Van Balkom (2002) did not find a significant difference in change in obsessional beliefs as measured by the OBQ between non-responders and responders.

The main goal of the present study is to establish whether changes in inferential confusion are associated with treatment outcome in a sample of OCD patients receiving standardized CBT involving the use of cognitive challenges and reality testing following published guidelines (Van Oppen & Arntz, 1994; Freeston, Rhéaume, & Ladouceur, 1996; Salkovskis, 1999) without specifically targeting inferential confusion (O'Connor & Robillard, 1999). Thus, the approach focused on education in the normalization of intrusions with subsequent challenges of the exaggerated conclusions and appraisals using socratic dialogue or other cognitive techniques, while exposure elements were presented to the client in a `reality testing` format.

In line with our theoretical formulation we hypothesized the following: 1) greater changes in inferential confusion would be associated with improved treatment outcome; 2) inferential confusion represents an independent process from appraisals and reactions to the obsession. In addition, we carried out two further exploratory investigations concerning the relationship of inferential confusion with conviction levels in primary inferences, and the extent to which inferential confusion is a predictor for poor treatment outcome.

METHOD

Participants

Participants in the study were recruited through referrals to our research clinic, followed by a two-stage process using telephone screening interviews and by initial questionnaires returned by post and a face-to-face diagnostic interview with one of the participating psychiatrist. Baseline diagnosis used three structured interviews to provide adequate description of clinical features. First, all patients were diagnosed using the *Anxiety Disorders Interview Schedule for DSM-IV*, a structured interview that

diagnoses anxiety disorders and exclusionary conditions (see below) (ADIS-IV; Brown, Di Nardo, & Barlow, 1994). Second, participants were administered the *Yale-Brown Obsessive-Compulsive Scale* (Y-BOCS; Goodman, Price, Rasmussen, Mazure, Delgado, Heniger, & al., 1989; Goodman, Price, Rasmussen, Mazure, Fleischman, Hill, & al., 1989). Positive response to any of these screens led to use of appropriate sections of the *Structured Clinical Interview for DSM-IV Axis I Disorders* (SCID-I) (First, Spitzer, Gibbon, & Williams, 1997; First, Gibbon, Spitzer, Williams, & Benjamin, 1997) to complete the differential diagnosis. Entry criteria were: (a) a primary diagnosis of OCD, (b) presence of overt compulsions for at least one hour a day, (c) being medication free for at least 12 months prior to screening, (d) no evidence of suicidal intent, (e) no evidence of current substance abuse, (f) no evidence of current or past schizophrenia, bipolar disorder or organic mental disorder.

Participants who met the entry criteria received cognitive-behavioural therapy for the duration of a 20-week course of treatment. All participants were seen individually by therapists for a period of 4 session evaluations and 20 session treatments. Participants were evaluated by an independent clinician after 10 weeks, to evaluate whether there were any contra-indications to continuing treatment (worsening of condition, new condition, motivation problem, inability to progress in current treatment). If there were contra-indications, the participant was withdrawn from the research program and referred to more appropriate standard management. A total of 9 people abandoned treatment or were withdrawn from the study for various reasons (no progress, lack of motivation, unable to complete the exercises or to keep appointments, etc). The final sample consisted of 35 participants (15 males and 20 females) who completed the 20 week therapy. Mean age was 40.1 years. No significant differences were found between those who abandoned or completed treatment on any of the socio-demographic data.

Main dependent variables

The main dependent variables assessed symptoms and cognitions that were direct targets of the intervention.

Clinician assessment: *Yale-Brown Obsessive-Compulsive Scale* (Y-BOCS) (Goodman, Price, Rasmussen, Mazure, Delgado, et al., 1989;

Goodman, Price, Rasmussen, Mazure, et al., 1989; Vézina, Freeston, Soucy, Poulit, Richard, & Ladouceur, 1995). The Y-BOCS is the instrument of choice for clinician assessment of OC symptoms and severity. The Y-BOCS was used to assess overt and covert neutralizing separately (Vézina et al., 1995). Studies confirm the validity and reliability of the principal scales (ICC = .91-.94, $r_s = .90$) (Steketee, 1994; Taylor, 1995). An independent assessor administered the Y-BOCS at pre-, mid-, post-treatment, and follow-ups. Following pre-treatment assessment (ADIS, Y-BOCS and SCID-I) and before therapy, all patients received four individual 1-hour evaluation sessions. The Y-BOCS was administered by a trained independent clinician and was defined as the primary outcome variable.

Questionnaire symptom measures: *The Inferential Confusion Questionnaire* (ICQ-15; Aardema, O'Connor, Emmelkamp & Marchand, Todorov, 2004). This questionnaire measures several key aspects of inferential confusion as formulated by O'Connor & Robillard (1995). Factor-analyses have indicated that the ICQ is a unidimensional measure that independently contributes to the prediction of obsessive-compulsive symptoms while controlling for other cognitive domains and negative mood states. Items reflect a tendency to distrust the senses and to inverse inference, where the person infers a state of affairs in reality without any actual indication of it being present or even in contradiction to what is seen or sensed. The 15 items ($\alpha = .92$) of the ICQ-15 are scored on a five-point scale: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree. The *Padua Inventory* (Sanavio, 1988) is a comprehensive 60-item self-report inventory of obsessions and compulsions. The total scale ($\alpha = .96$) and the subscales are reliable ($\alpha = .75-.91$). The *Beck Anxiety Inventory* (BAI) (Beck, Epstein, Brown, & Steer, 1988) is a 21-item anxiety symptom checklist rating symptom intensity for the last week on a 0-3 scale ($\alpha = .82$). The *Beck Depression Inventory* (BDI) (Beck, Rush, Shaw, & Emery, 1979) is a 21-item measure of depressive symptoms ($\alpha = .92$).

Clinician rated and self-monitored inference processes: Inference processes relevant to the IBA were assessed to identify primary and secondary inferences through interview techniques following a logical template as developed by O'Connor & Robillard (1999). For example:

- Client (C): If I don't wash my hands, I might get ill.
- Therapist (T): And you would get ill if what state of affairs is true?
- (C): Well, if my hands are not clean.
- (T): So you're washing your hands for what?
- (C): Well, to make sure there are no dangerous germs on my hands.
- (T): So, when you go to wash, precisely what thought comes into your head?
- (C): That there might be dangerous germs on my hands.

The primary inference or doubt in this instance is 'There might be dangerous germs on my hands' followed by the secondary inference '(Then) I will become ill'.

Strength of primary inferences and secondary inferences were measured by the therapist for each obsession completed pre- and post-treatment (0-100). The primary inference was measured (e.g. my hands could be dirty; the door might be unlocked) in terms of degree of probability (0-100) (e.g. how probable is it that your hands might be dirty?; how probable is it that the door is unlocked?). The secondary inference (e.g. if my hands are dirty, I'll contaminate my whole family; if my door is unlocked I'll be robbed) was rated according to how realistic the consequence was (0-100). In accordance with the IBA model, we considered a highly rated degree of probability in the primary inference as indicative of an over-investment in this obsessional doubt.

Therapists

CBT interventions were carried out by five therapists skilled in cognitive-behavioural treatment. Three of the therapists were licenced psychologists, whereas the others were doctoral students. All therapists were trained by an experienced clinical psychologist specialized in cognitive-behavioural therapy in the form of workshops and regular meetings. In the course of treatment, therapists were supervised individually on a weekly basis; bi-weekly meetings were held with all therapists to discuss cases, and ensure treatment integrity.

RESULTS

Test-Retest Validity

The ICQ was administered twice pretreatment in order to establish the test-retest validity of the ICQ. Elapsed time between administration was approximately 3 months. Test-retest correlation between both measurements and was 0.74 ($p < 0.001$).

Treatment outcome

Means and standard deviations before and after treatment of the process variables and outcome measures are represented in table 1.

Table 1. Differences pre and post treatment on measures

	M	SD	M	SD	t
	Pre		Post		
Y-BOCS	26.6	6.4	15.0	7.2	7.43***
Padua Inventory	91.9	41.0	54.1	34.7	5.93***
Inferential Confusion (ICQ)	47.9	12.5	38.1	13.1	4.19***
Primary Inference (PI)	47.8	26.2	16.2	17.1	5.93***
Secondary Inference (SI)	42.9	24.1	12.2	15.1	5.89***
Depression (BDI)	14.1	7.5	9.3	7.5	3.05**
Anxiety (BAI)	17.3	10.9	9.5	8.2	5.45***

*** $p < 0.001$ ** $p < 0.01$

Paired sample t-tests were performed to establish whether or not treatment was successful in reducing symptoms. Scores on obsessive-compulsive symptoms (Y-BOCS), depression (BDI) and anxiety (BAI) significantly reduced in the course of treatment. Likewise, scores on primary inference, secondary inference and inferential confusion were significantly lower post treatment as compared to pre-treatment levels.

Responders and non-responders

Inferential confusion, cognitive change and treatment outcome

In order to establish whether changes in inferential confusion were relevant to treatment outcome the sample was divided between responders and non-responders. Treatment responders were defined as 33% or more improvement post treatment as compared to pre-treatment scores on the Y-BOCS (cf. Emmelkamp, Van Oppen & Van Balkom, 2002). This criteria led to the identification of 11 non-responders and 19 responders. Individual t-test were performed in order to establish whether change in ICQ scores were significantly different for non-responders versus responders (see table 2). Similarly, we calculated whether changes in primary inference and secondary inference were significantly different for both groups.

Table 2. Differences between non-responders and responders in change on Inferential Confusion (ICQ), Primary Inference (PI) and Secondary Inference (SI)

	Mean Change				t
	Non-responders	SD	Responders	SD	
ICQ	-0.72	7.9	-15.6	11.2	3.82***
PI	-20.9	21.9	-36.9	27.7	1.46
SI	-18.3	17.2	-39.0	25.5	2.12*

*** p <0.001 * p<0.05

Non-responders decrease significantly less than responders on inferential confusion in the course of treatment. In fact, almost no change was observed on inferential confusion scores among the non-responders. There was however no significant difference between non-responders and responders in changes on primary inference, while responders improved significantly more on secondary inference than non-responders.

Finally, we calculated whether initial scores on the process variables would predict treatment outcome in terms of Y-BOCS scores. Pearson correlations showed that baseline scores on the ICQ, primary inference and secondary inference were not significantly related to changes in Y-BOCS scores before and after treatment. Thus, baseline scores on these measures did not predict poor treatment outcome.

Inter-relationships among cognitive measures pre and post treatment

We calculated the relationships between the process measures (Inferential Confusion, primary inference and secondary inference) before treatment in order to establish whether these measures represent independent aspects of obsessional thinking (see table 3). Level of conviction in primary inference and realism of secondary inference was established by calculating the mean of scores on the three highest scoring obsessions in the hierarchy of the clinical scales for each participant.

Table 3. Interrelationships between Inferential Confusion (ICQ), Primary Inference (PI) and Secondary Inference (SI).

	ICQ		PI		SI	
	Pre	post	Pre	Post	Pre	Post
Inferential						
Confusion (ICQ)	0.55**		0.07	0.08	-0.21	0.07
Pre	1.00		-0.26	0.33	-0.28	0.37
Post						
Primary inference						
(PI)	-	-	1.00	0.33	0.69***	0.44*
Pre	-	-	-	1.00	0.21	0.93***
Post						
Secondary						
inference (SI)	-	-	-	-	1.00	0.29
Pre	-	-	-	-	-	1.00
Post						

*** p <0.001 ** p<0.01 * p <0.05

Inferential confusion was not related to levels of primary inference and secondary inference pre and post treatment. Pre treatment levels of inferential confusion were significantly related to post levels of inferential confusion. Pre treatment levels of primary inference and secondary inference were not related to their respective post treatment levels. As expected, primary inference and secondary inference are significantly related with each other at pre and post treatment. Also, post-treatment levels

of secondary inference were significantly related to pre-treatment levels of primary inference, whereas post-treatment levels of primary inference were not related to pre-treatment levels of primary inference.

Changes in inferential confusion and symptom measures

We calculated the relationship between changes in inferential confusion with change in YBOCS and the Padua total score. Change in inferential confusion was both significantly related to change in Y-BOCS scores ($r = 0.44$; $p < 0.05$) as well as change in Padua scores ($r = 0.46$; $p < 0.05$). Also, in order to investigate the differential validity of inferential confusion as a measure for treatment outcome in obsessive-compulsive disorder we also calculated the relationship between changes in inferential confusion with changes in anxiety and depression pre and post treatment. Pearson correlations showed a non-significant relationship with anxiety (0.27) and depression (0.29) thereby providing evidence for the unique relevance of the inferential confusion process for obsessive-compulsive symptoms, independent of anxiety and/or depression, as a measure for treatment outcome.

DISCUSSION

The principal aim of the current study was to establish whether changes in inferential confusion are associated with treatment outcome. Previous studies have already shown that therapy specifically targeting inferential confusion enhances treatment outcome for those individuals with a high obsessional conviction (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre, 2004). Results of the current study indicate that changes in inferential confusion as measured by the ICQ were associated with the treatment success of CBT. Change in obsessional conviction as measured by strength of primary inference did not discriminate between non-responders and responders, whereas secondary inferences did discriminate between both groups. This is not surprising, since conviction levels as measured by the primary inference have been proposed to operate independently from the severity of obsessive-compulsive symptoms, but largely comes into play when obsessional conviction is high and where primary inferences dictate subsequent

reactions to the obsession in terms of secondary inferences and symptomatology (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre, 2004). In addition, primary inferences were not specifically targeted during treatment and previous research has shown that there is a non-linear relationship between primary and secondary inference in the sense that the relationship is stronger if primary inferences are higher in terms of conviction level. Indeed, post hoc analyses on the relationship between primary and secondary inferences in a subsample of the current study shows a non-significant relationship if the primary inference is lower than 50 ($r=0.17$; $p=0.50$), whereas the relationship between primary and secondary inference for the total is much higher ($r=0.69$; $p<0.001$).

The current results indicate that inferential confusion is not related to the level of conviction by which primary inference are held, nor was there a relationship with secondary inferences. The latter confirms our expectation that inferential confusion represents a process that operates independently from appraisals and reactions to the obsession that follow logically from the primary inference. In addition, the lack of a relationship between inferential confusion and primary inferences confirms the role of inferential confusion in OCD as a general reasoning bias in OCD. Thus, although the concept of inferential confusion was inspired by clinical observations of OCD with overvalued ideation (O'Connor & Robillard, 1995), it is empirically and conceptually distinct from these schizotypal characteristics. However, the relationship between inferential confusion and other schizotypal characteristics in OCD remains of interest, since besides inferential confusion representing a non-phobic characteristic in OCD that leads the imagination to trump the senses, it may account for a variety of other schizotypal symptoms in OCD. In particular, one would expect that inferential confusion accounts for some schizotypal characteristics in OCD where absorption into imaginary sequences leads to several perceptual disturbances. Such absorption may subsequently hamper the incorporation of sense information in the decision process to disengage from neutralizing behaviours as well as increase the intensity and persistence of obsessions (O'Connor & Aardema, 2003).

The final aim of the current study was to establish whether inferential confusion was a predictor for poor treatment outcome. However,

inferential confusion, unlike other schizotypal characteristics such as perceptual disturbances and delusional thinking, was not found to be a predictor or bad treatment outcome. Likewise, obsessional conviction in primary inference was also not related to poor treatment outcome. However, the measurement of obsessional conviction in terms of primary inferences has been found to be empirically meaningful in that those who are characterized by high obsessional conviction benefit more from an inference based approach than standard cognitive-behavioural therapy (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Tremblay, Pitre, 2004). In addition, the level of primary inference or insight may vary over obsessions within the same subject and may be a state function of absorption. Further refining of the measurement of conviction levels in primary inferences may be necessary, in particular with regard to the measurement of primary inferences both in and outside of the OCD situation in order to obtain a more refined measure of the ego-dystonic and ego-syntonic experience of obsessions.

So far, it appears that the investigation of OCD from an inference based approach aids the identification of cognitive markers relevant to this disorder. In this respect, it is important to note that cognitive approaches to OCD, which emphasize the exaggerated interpretation of intrusive cognitions, have faced several difficulties on account of their modest relationships between cognitive beliefs and treatment outcome. Consequently, it has been suggested that changes in current measures of cognitive beliefs and appraisals may be an epiphenomena of changes in mood states, (Emmelkamp, 2002a, 2002b). Changes in cognition may of course be artifacts of successful treatment and hence the importance in the present study of the differential relationships between the ICQ and treatment outcome variables. In particular, it is noteworthy that changes in inferential confusion were related to changes in Y-BOCS and Padua scores, but not related to changes in anxiety and depression. Further research in this area is important, since cognitive measures that are able to show differential effects on treatment outcome represent the next evolution in the measurement of cognitive markers proposed for OCD.

Chapter 7

The Application of an Inference Based Approach to Obsessions without Overt Compulsions¹

Abstract

Meta-cognition refers to the notion of thoughts about one's own thoughts and has been defined as knowledge and cognition about cognitive phenomena (Flavell, 1979). In recent years meta-cognitive models have provided accounts of the maintenance of anxiety disorders (e.g. Wells, 2000). Meta-cognitive models would argue that the thoughts about the appearance and utility of otherwise normal thoughts generate anxiety. In this article we apply a meta-cognitive approach to understanding obsessions, but rather than thoughts about thoughts, we suggest that the ruminations in obsessive-compulsive disorder (OCD) without overt compulsions result largely from thoughts about thoughts that do not actually occur. The person with obsessions thinks they might have or might have had the thoughts, and through a meta-cognitive process termed 'inferential confusion' confuses these imagined thoughts with actual thoughts. This account would explain the repetitive, compulsive yet ego-dystonic nature of obsessions. The justification, provided by patients with OCD, for treating imaginary thoughts as actual thoughts appears to be an imaginary narrative, which produces and maintains the obsessional preoccupation, and seems imposed on reality by a distorted inductive reasoning process.

¹ Aardema, F., & O'Connor, K. (2003). Seeing white bears that are not there: Inference processes in obsessions. Journal of Cognitive Psychotherapy. © Springer Publishing Company, Inc. New York 10036 a publisher. Reproduced with permission

Introduction

Cognitive-behavior therapy (CBT) has made significant progress in the treatment of obsessive-compulsive disorder (OCD) for the majority of OCD clients with meta-analyses on CBT treatments showing large effects that seem to indicate that between 75 and 85% of patients benefit from CBT (Abramowitz, 1996, 1997, 1998; Steketee & Shapiro, 1993; Hiss, Foa, & Kozak, 1994; van Balkom, van Oppen, Vermeulen, van Dyck, Nauta, & Vorst, 1994). However, there are a substantial number of patients without any obvious rituals (Emmelkamp, 1982; Rachman, 1985). Traditionally, such patients have been remarkably treatment resistant. Rachman (1971) has outlined a number of reasons why such patients may have problems with exposure including the persistence of subtle covert neutralization and avoidance, and also the use of counterproductive coping strategies. Cognitive behavior models targeting covert rituals and neutralizations have recently been successfully adapted to treat obsessional ruminations (Freeston, Ladouceur, Gagnon, Thibodeau, Rhéaume, Letarte, & Bujold, 1997).

Meta-cognitive approaches to OCD offer an additional level to cognitive analysis. Meta-concepts generally revolve around the role played by thoughts about thoughts and as applied in OCD would view obsessions as developing subsequent to the meta-cognitive appraisal of thought intrusions. The appraisals in OCD with and without overt compulsions are considered to be the product of specific meta-schema such as inflated responsibility (Salkovskis, 1989), thought-event fusion (Wells, 1997) and thought-action fusion (Rachman & Shafran, 1999). Treatment studies based on these (meta)-cognitive models seem to offer effective treatment although the importance of the cognitive element in these programs remains contentious (Rheaume & Ladouceur, 2000). Also, there is growing controversy over the type of appraisal considered likely to maintain obsessions. Salkovskis (1989) identifies assumptions about responsibility as the principal appraisal schema, while others view this schema as a consequence of other appraisals (Wells, 1997), and yet others suggest a plethora of appraisals may produce obsessions (Freeston et al., 1997) and question whether surface or deep schema are the more likely culprits (Sookman, Pinard, & Beauchemin, 1994; Sookman & Pinard, 1999).

In a recent validation of the Obsessive Beliefs Questionnaire, OCD patients scores higher than non-OCD controls so providing 'limited but encouraging' evidence of the specificity of the cognitive domains to OCD (Obsessive Compulsive Cognitions Working Group, 2001). However, studies comparing the predictive validity of such domains, have in fact, highlighted other meta-cognitive factors involving inverse inference and inferential confusion (Emmelkamp & Aardema, 1999). These meta-cognitive factors touch on the issue of overlap between OCD and Delusional Disorder, but they also help explain some of the features unexplained by the appraisal model (Foa, Steketee, Gayson, & Doppelt, 1983; Kozak & Foa, 1994).

Inferential confusion has been defined as mistaking a far-fetched hypothetical possibility for a real probability and then acting *as if* the imagined possibility is real (O'Connor & Robillard, 1995, 1999). Inferential confusion arises as a result of a supporting narrative giving credibility to the initial obsessional intrusion or inference and is characterized by a number of distorted reasoning processes. 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, would result in pathological doubt about reality. Inferential confusion differs from thought-action or thought-event fusion since it identifies obsessional thinking not as a mistaken belief that thoughts about an act or event are the moral or physical equivalent of performing it, but as a confusion between reality and possibility. The source of error is not in distorted cognitive perception as a result of dysfunctional meta-cognitive beliefs, but in a disordered imagination that is characterized by distorted meta-cognitive processes.

However, while inferential confusion as elaborated by O'Connor and Robillard (1999) can account for several of the features seen in obsessions accompanied by overt compulsions such as washing and/or checking it does not explicitly address the confusion in obsessions where the main concern of the OCD patient revolves around the content of the obsession. For instance, an obsession such as 'God is dead' clearly cannot involve a confusion between an imagined reality and an actual physical reality since such an obsession does not pertain to an actual physical reality.

The present article introduces a meta-cognitive process that forms part of the wider problem of inferential confusion which we have termed

“thought-thought fusion” (Aardema & O’Connor, 2002) and which could account for several of the clinical features seen in OCD without overt compulsions. It is hypothesized that the obsessions of these OCD patients may be meta-cognitive thoughts about thoughts that do not actually occur. As such, it is proposed that obsessions are the result of a distorted meta-cognitive process where the imagined possibility of having a thought is confused with the actual occurrence of the thought. In the following sections we explore this construct by looking at the clinical evidence of inferential confusion in the development of obsessional ruminations.

Analogue models of obsessions

The experiments of Wegner, Schneider, Carter and White (1987), which showed that thought suppression increases the frequency of the thought, have been proposed as an analogue model of obsessions for understanding OCD (Purdon, 1999). In their thought suppression experiments participants were either instructed to suppress or express thoughts about a white bear during which the frequency of thoughts about white bears were monitored. This first period was followed by a second period in which the suppress and express instructions were reversed. Those who first received the suppress instructions showed a higher occurrence of thoughts about white bears as compared to those who first received the express instructions, suggesting that suppression leads to a rebound effect. The clinical significance of these findings would be that they mirror the thought suppression of obsessions in patients suffering from OCD.

Several other studies have been conducted to examine the effects of suppression of obsessional thoughts focusing both on immediate thought enhancement (during suppression) and rebound effects (Rutledge, 1998; Salkovskis & Campbell, 1994; Trinder & Salkovskis, 1994; McNally & Ricciardi, 1996). Purdon (1999) concludes that these studies produced mixed findings in terms of increased thought frequency, with only two studies showing a paradoxical effect of suppression during suppression efforts (Salkovskis & Campbell, 1994; Trinder & Salkovskis, 1994) and one study finding a trend towards a rebound effect (McNally & Ricciardi, 1996).

A phenomenological examination of what actually occurs in the mind of the person trying to suppress a thought may provide some clues as to the mixed findings of these studies investigating the obsessional paradox of

immediate thought enhancement during suppression. An examination of one such transcript of the thoughts going through a participant's mind while suppressing appears to reflect a lot of thoughts of task instructions and thoughts about the thought the person is attempting to suppress. Typically, this may include the following (* indicates a bell ring):

Of course now the only thing I'm going to think about is a white bear...I could ring this bell over and over* and over*...One thing about this is every time that I really want like...ummm...to talk, think, to not think* about the white bear, then it makes me think about the white bear more so it doesn't work...Okay, it's like I have to force myself to not think* about the white bear...It's like every time I try and not think about a white bear, I'm still thinking about one, and I'm tired of ringing the bell...(Wegner, 1989, p. 3)*

Is it correct to interpret the thoughts about white bears in the above example as intrusions that are relatively isolated from the attempt to suppress? Instead, it appears that this person just had many thoughts about the task, which happen to include a thought of a white bear. The thought 'to not think of white bears' does not make up an actual intrusion, but is in fact an 'intrusion' of task instructions. If the thoughts about white bears are primarily embedded in other thoughts ("I have to avoid thinking of..."; "I might think of..."; "I should not think of..." or "I could think of...") then this would suggest that the 'neutralizing thought' or 'monitoring thought' is primarily a meta-cognitive thought about the possibility of having the thought. If so, current conditions in thought suppression experiments do not suffice since "mention" instructions draw upon the same meta-cognitive process and confusion as the instruction to suppress, which could explain the relatively large number of studies where no thought suppression effects were found.

It is well known that meta-cognitive judgements about cognitive states often fail to accurately represent these cognitive states, or may even represent thoughts about cognitive states that do not exist (Rosenthal, 2000). Likewise, the meta-cognitive representation about the possibility of having the thought is clearly not the same as having the thought and as such the intrusions in thought experiments may not actually occur. Instead, the

“intrusion” appears to be embedded in a meta-cognitive thought that automatically brings the “to-be-avoided” thought within awareness. Thus, a higher frequency of thoughts in thought suppression experiments may signify a greater tendency to confuse ‘task intrusions’ with actual intrusions.

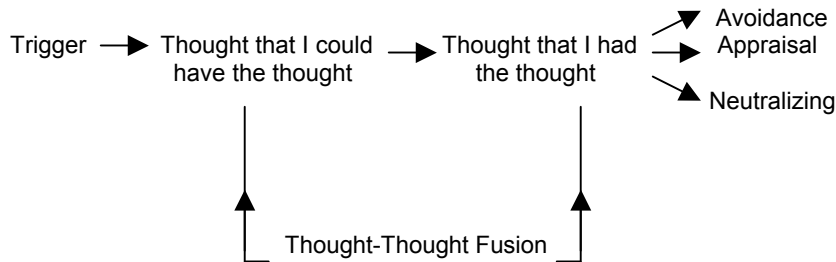
A similar argument has been made by Navon (1994a, 1994b) who argues that there is no need for an “ironic” monitoring process (Wegner, 1989) to explain thought enhancement, because it could already be accounted for by failures in operation. Thought enhancement during thought suppression (or cognitive evasion as Navon calls it) is explained by the automatic tendency of attention to address the “to-be-avoided” concept as a direct result of the attempt not to think it. In other words, goal setting behavior may tend to mobilize attentional resources towards possible goal relevant information in spite of the fact that directing attention towards goal relevant information can be in conflict with the goal.

If thought enhancement results from failures in operation alone then this would suggest that people with OCD have a general difficulty with meta-cognitive processing that revolves around not being able to let intent take its course without having to repeatedly remind oneself of the intent; this reminding inadvertently brings the ‘to be avoided’ thought back into awareness. OCD patients often feel obliged to continually remind themselves not to forget, possibly reflecting a general tendency to direct more attention towards meta-cognitive goals and intents. Such a tendency facilitates thought enhancement, which may or may not be further exacerbated by a high emotional investment in the goal to not have a thought.

In summary, it is suggested that thought suppression experiments basically reflect the meta-cognitive processing of thoughts, images and impulses, which inadvertently includes the mental phenomena one is trying to avoid. It is argued that for those who report many intrusions in thought suppression experiments, there is an inability to recognize the meta-cognitive aspects of their own thoughts. As an analogue model of obsessions this analysis suggests that the OCD patient is caught in a meta-cognitive processing which disallows the normal stream of consciousness to take its course due to a confusion between meta-cognitive thoughts about thoughts that have not occurred and actual thoughts. This meta-cognitive confusion may be termed Thought-Thought Fusion, since it confuses

thinking about having a thought with the experiencing of the thought (Aardema & O'Connor, 2001). This model can be schematically represented as:

Figure 1. Schematic model of thought-thought fusion.



In the above model there is no such thing as an intrusion. Of course, the meta-cognitive thought itself does occur and by no means is the *meta*-cognitive thought imaginary. However, if this meta-cognitive thought refers to a state of affairs that is incorrect or non-existent (the assumed occurrence of a thought that has in fact not occurred), then this meta-cognitive thought *reflects* an imaginary state of affairs. Then, to the extent that imaginary things refer to things that are not there, an intrusion is an *imagined* thought.

The confusion that follows consists of the erroneous 'assumption' that a meta-cognitive thought about a thought is the same as having the thought. Such thought-thought fusion forms part of the wider problem of inferential confusion where the person confuses an imaginary state of affairs with an actual state of affairs. Thought-thought fusion specifically refers to an imagined cognitive state of affairs within the person (e.g. the erroneous meta-cognitive thought about blasphemy, sexuality, impulses etc.) and elicits exclusively *covert* compulsions, while the wider definition of inferential confusion applies to both covert and overt compulsions.

The phenomenology of obsessions

How does conceptualizing an intrusion as an imagined thought (the thought of thoughts one could have or might have, but did not have) enhance our understanding of the phenomenology of obsessions? First of all, it explains parsimoniously why obsessions are experienced as ego-dystonic. If obsessions are thoughts about thoughts that have not occurred and not reality (i.e. 'thoughts that have occurred') then they are unbounded in their absurdity and senselessness. Those with obsessional ruminations unwittingly may act *as if* they have recurrent and persistent thoughts or images intruding upon consciousness when in fact they are actually thinking of the possibility. Because they do not actually have the thoughts, they accurately perceive the thoughts as alien and absurd. The intrusions are not actual thoughts with a motivational component or thoughts that come about in a normal way. Instead, the 'intrusions' in obsessional ruminators are meta-cognitive thoughts, but because these ruminators act *as if* the thoughts are actually experienced like any other thought, they cannot do anything else other than take these thoughts seriously whether they appear senseless and absurd or not.

As in the case of obsessions pertaining to physical reality (O'Connor & Robillard, 1995) we would expect that obsessional ruminators have no problems with correctly perceiving reality unrelated to the obsessional preoccupation. In other words, they will perceive their actual thoughts, feelings and images quite accurately and these thoughts require no rumination about their specific meaning for OCD patients with obsessional ruminations, since the sense of thoughts and feelings is readily transparent and self-evident. In contrast, in the case of imagined thoughts or impulses the person with inferential confusion will never be sure whether such thoughts are part of him/herself or whether they actually signify something else, exactly because their nature and occurrence is imagined. Furthermore, as these feared thoughts are imaginary in the first place and have not actually occurred, the "obsessions" cannot readily be removed from consciousness by reality testing or thought control. Trying not to have a thought that is not there obviously will be a fruitless endeavor unless the person with obsessional ruminations comes to recognize the imaginary quality of these thoughts. For example, take the following type of intrusion of

an OCD client concerned with harming her baby: “I have to avoid thinking of suffocating...” or “I might again think of suffocating...”

In the above thought the OCD patient has actually succeeded in stopping the train of thought at the point where she thought she was about to start thinking of the actual obsession. This thought stopping might involve distraction, countering with another thought or other covert neutralizing strategies (Freeston, 1997). Whether the actual thought or image is completed or not, this OCD patient never had an actual thought or impulse of harming a baby. She *imagined* having a thought about harming the baby instead of actually having it. Actually having the thought of harming the baby is not the same as imagining having a thought of harming the baby. An actual thought would take a form such as “I *will* harm my baby and suffocate it” as opposed to “I *might* think of...” or “I *could* harm my baby”. The latter examples are based in the imagination, whereas the first is based in an actual impulse or a thought with a motivational component. As such, patients with OCD without overt compulsions may have set themselves up for an imaginary battle in which there are no winners. They attempt not to have thoughts they have not had, but trying not to have a possible thought automatically implies that the thought is possible. The OCD patient with obsessional ruminations is unaware of the confusion between thinking “I could think that God is dead” and actually thinking “God is dead”. Since trying not to have the thought always implies its possibility and the possibility of the thought is experienced as having the thought, the person is caught in a perpetual cycle.

The role of the imagination in OCD

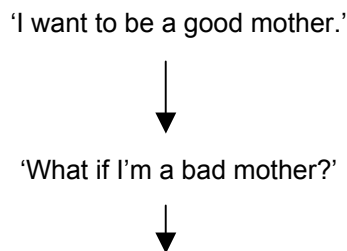
Formulating obsessions as meta-cognitive thoughts about thoughts that do not occur does not imply that the OCD patient may not experience very vivid images and scenario’s accompanying the initial thought. One objection to the inferential confusion model might be that obsessions often take the form of flashes and images. However, it is proposed that these images are the result of an “as if”-scenario initiated by the inference that a particular thought or impulse might be present. In other words: “...since the content of one’s HOT [higher-order thought] determines what it’s like for one to be in a mental state, an erroneous HOT may well make it seem, from a first-person point of view, as though one were in a mental state that one is

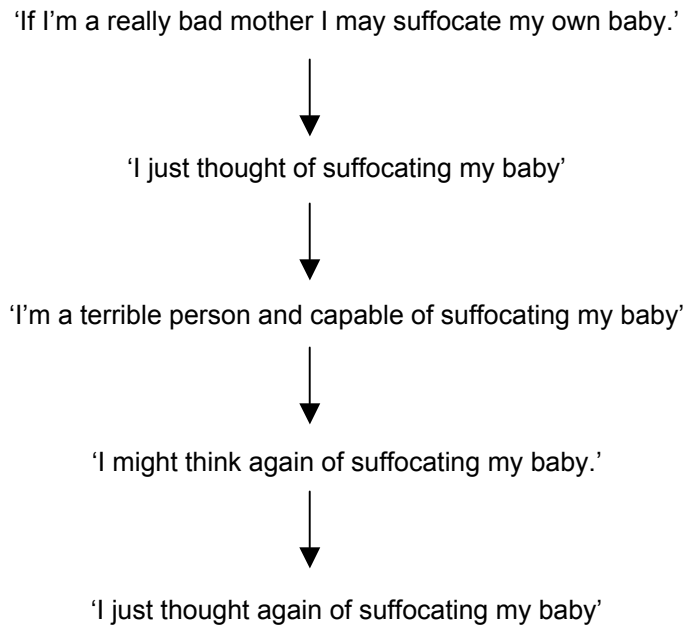
not in fact in” (Rosenthal, 2000, p.285). For instance, the initial meta-cognitive thought that one might have the impulse to harm someone is experienced as/confused with an actual impulse. The result of this confusion could be to trigger a whole scenario of harm with all accompanying emotions and images *as if* a particular thought or impulse were actually present.

Once the distinction between thinking about the thought and having the thought has become lost, the “lived” character of the obsession or inference may be further exacerbated by confirmatory strategies. Patients with obsessional ruminations may start deliberately (or obsessively) putting themselves into situations that may provoke the thought in order to confirm that they still have (or have not) the (imagined) thought. One of our clients who had significantly improved in therapy became preoccupied with the idea that the obsessions could return. The thought about the possibility of the obsessions returning was soon followed by a barrage of pseudo-obsessions (spontaneously generated on the spot), whose specific content was serendipitous and not considered to be in itself of any importance. Another client who imagined that he could have sexual thoughts towards a relative placed himself continually in situations, which he thought might produce such sexual thoughts, in order to test himself. Of course, he succeeded in making himself anxious, and used the artificially induced preoccupation under ‘test conditions’ as proof of his potential ability to experience forbidden sexual thoughts.

Conceptualizing OCD without overt compulsions as a confusion between imaginary thoughts and actual thoughts not only accounts for the obsessional preoccupation but could also account for the initial manifestation of the imagined obsession. An example of the logical sequence by which OCD may develop is depicted in figure 2.

Figure 2. Thought sequence characterized by inferential confusion





The most we can accuse this mother of having is perhaps a somewhat morbid imagination, but in none of the different steps of the sequence has she actually thought of hurting her baby. Instead, she imagined having a thought or an impulse of hurting and harming her baby. The bad mother in the logical sequence isn't actually the mother herself, but an imagined entity that does not exist in reality. It is not simply a vivid imagination on its own that accounts for the particular sequence and the development of obsessional ruminations in this example, but the initial doubt of being a good mother or not and the logical sequence that follows characterized by inferential confusion.

In the book "Stop Obsessing" Foa and Wilson (1991) describe the case of Joel in the development of his OCD symptoms.

One night Joel watched the child sleep in the crib, he suddenly had the impulse to kill her. Joel then began to panic: His heart raced, he became dizzy, his legs became weak, and he started shaking. The impulses continued through the night, robbing him of his sleep. After

that night, Joel experienced the impulse to kill his daughter forty to fifty times a day (Foa & Wilson, 1991, p. 52)

In contrast with the description of Foa and Wilson's description the following is Joel's own account of what actually happened:

All of a sudden I had this thought that I could kill her, that I might strangle her with a cord or stab her with a knife. My immediate reaction was 'I could never hurt my daughter'. Yet I couldn't banish the negative thought from my head...I finally returned to work, but I continued to dwell on the thought that I could kill my daughter and on thoughts that God was telling me to do this (Foa & Wilson, 1991, p. 203).

Those two accounts differ in important respects from one another. In Joel's account he never experienced an actual impulse to kill his daughter even though he may think he did. Instead, he imagined that he *could* kill her and that he *might* strangle her. Of course, Joel *could* or *might* kill his baby as anyone else *could* or *might*, but this does not constitute an actual impulse or wish to kill. At no point did Joel experience an actual impulse to kill his daughter as described by Foa & Wilson (1991). Instead, he imagined having the impulse and confused imagining having an impulse with actually having an impulse, which accounts for his reaction to these thoughts.

Foa & Wilson (1991) remark later in their description that Joel's willingness to accept his impulses was the turning point in the therapy. In the current account of OCD as described in this article, we would find acceptance of an impulse that is not actually there problematic even if such a procedure might alleviate anxiety. Instead, the OCD client is better to recognize that he/she confuses imagining having a thought or impulse with actually having one.

This argument concerning the distinction between thinking about having a thought, and actually having a thought, could also explain how the preoccupation with thinking a particular thought, can lead after attempts to suppress it to a preoccupation with the opposite thought. For example, a person originally preoccupied by thoughts of a woman, may instruct himself to stop thinking such thoughts. Subsequently, he may become preoccupied

with thoughts about not thinking of the woman. Preoccupation with the meta-cognitive process of thinking about the thinking takes precedence over the evaluation of the actual event itself. So how do people come to confuse what is, with what is not? In part, they may be led up to the conviction by a distorted reasoning or narrative process which makes the confusion seem like a plausible inference.

‘Intrusions’ as primary inferences

Intrusions do not occur in a vacuum as Rachman (1998) and O’Connor (2002) have argued, but are preceded by a stimulus or percept, which initiates a narrative of what is present and what the consequences will be. Initial thoughts of “God”, “sex” or “violence” may be internal percepts forming part of an internal context triggering the “intrusion” or “inference”. The internal context may be something said, a feeling, a memory or any other current event, which provokes the worrying intrusion/inference.

This was apparent in one of our patients who suffered from blasphemous obsessions. He recently moved from the United States to Quebec, which meant moving from a largely English speaking community to a largely French speaking community. Further, at the same time he moved in with his Greek grandfather who was in the habit of cursing in Greek. Both new experiences provided him with a whole new obsessional repertoire and often more colorful blasphemy than in English. It was quite clear that these new obsessions didn’t come out of the blue without a specific situation preceding them. It also seems very unlikely that this OCD patient actually experienced these new thoughts (i.e. actually cursing whether out loud or in one’s mind). Instead, the development of such new obsessions more likely took the form of thoughts such as “What other terrible things can I think of?”. This was confirmed by the patient. Another of our patients put it quite clearly: “When my obsessions get very severe I imagine what could be worse than this obsession and then something worse always comes along.”

Another example was a man who had once imagined that a woman could read his sexual thoughts and be shocked by this and reject him. The fear was based on a particular abstract conversation about women’s reactions to men. So every time he was in a particular situation with a woman he became preoccupied with the idea that he might have sexual thoughts which could be read by the woman. So he didn’t have the sexual

thoughts, but imagined having such thoughts and reacted “as if” he had. As such, his reaction to his thoughts about the sexual thoughts was incited by the story of what might happen rather than any moralistic motive. The maintaining factor here was not some static moral appraisal but a replaying of the imagined possibility. In other words, acting “as if” there were sexual thoughts and “as if” his thoughts could be read.

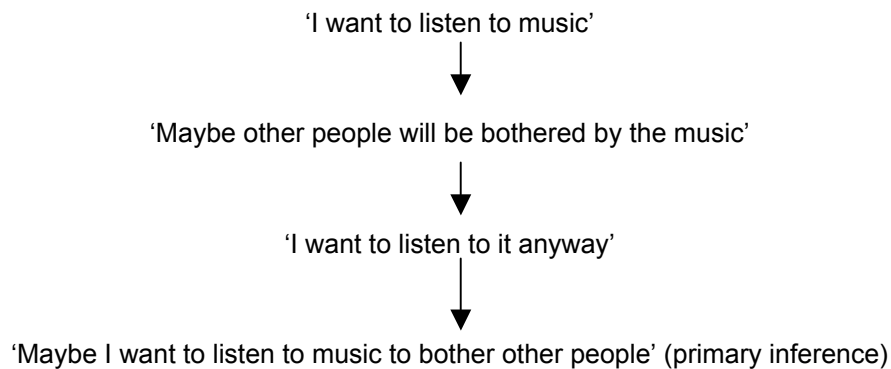
How does the OCD patient come to infer the presence of a thought that is in fact an imaginary thought? In the case of obsessional ruminations the question is what convinces the person to confuse thinking about having the thought with the thought. In our clinical work so far it appears that a highly charged narrative about what the person might be or might become dictates the confusion. These narratives appear similar to the narrative supporting inferential confusion in obsessions with overt compulsions and includes: irrelevant associations, a dismissal of actual evidence in support of a hypothetical reality and mistaking a far fetched narrative with an actual probability (O'Connor & Robillard, 1995). The following is a paraphrased narrative of a patient explaining the origin of one of her obsessions:

I dreamt of stabbing someone and enjoying it, which means I have the hidden desire to actually stab someone (going deeper into reality). The dream felt so real that I might be able to do this in real life also (irrelevant association). I know I never really hurt anyone in real life since these obsessions have started, but there always might be the possibility that I could (mistaking a far-fetched narrative with an actual probability). Even though I read about similar obsessions of other people and I know that people with OCD are not dangerous, their obsessions were never totally the same, which means I still might be dangerous (dismissal of actual evidence in favor of an hypothetical reality).

What is striking in the above account is that stabbing someone was experienced in a dream and not actually experienced as part of the normal stream of consciousness. Having the impulse is confused with dreaming of having an impulse. Even though the origin of the obsessions is not exactly an imagined impulse in the normal sense, it certainly cannot be traced back to intrusive thoughts.

For some OCD patients the tendency to engage in imaginary scenarios is especially clear. Examination of the particular sequence in which thoughts evolve is especially helpful in determining how the obsessional inference comes into existence. In one instance the sequence of thought was as depicted in figure 3.

Figure 3. Thought sequence leading up to a primary inference



The inference “Maybe I’m putting on music to bother other people” points toward an irrelevant association being made between the thought “I want to listen to music” and “Maybe other people will be bothered by it”. More specifically, the motivational component of wanting to listen to music is transfused into the idea that other people might be bothered by it. Further, the thought “I want to listen to it anyway” was suspect in the mind of this patient because it might indicate that she would listen to music whether people are bothered by it or not. Obviously, the whole thought sequence starts out with a simple wish to listen to music, which evidently is not the same as purposely putting on music to bother people. Yet, this fact is lost when the context motivating the initial thought of wanting to listen to music is swapped for an imaginary scenario producing a possible motivation (putting on music to bother people).

Implications for treatment

The 'inferential confusion' model is complementary to the cognitive appraisal approach and builds upon previous insights on the cognitive structure of obsessional thinking. Other cognitive theorists have noted the confusion between the real and unreal, and linked this magical thinking to the Piagetian concept of preoperational thought (Sookman, 1994). Clinical observations of thought-action fusion have however been mostly viewed as byproducts of other core cognitive schema such as over-responsibility (Craske, Dugas, & Shafran, 2000). However, the inferential confusion model considers meta-confusion a key characteristic of obsessional thinking in its own right. It anchors the process within a type of inductive reasoning termed inverse inference where the person unwittingly substitutes a hypothetical proposition about reality for reality.

Typically, inductive inferences are grounded in personal narratives, which lead up logically to the irrational belief. The narratives produce 'believed-in imaginings' (Sarbin, 1998) and the concern is to unravel the idiosyncratic plot, and refer to this plot rather than predefined cognitive domains in order to understand the obsessional conviction. Clearly, such a narrative plot may tie up with appraisal domains, but the inferential approach unlike the appraisal model focuses principally on the content of the initial intrusion as the primary inference in obsessional thinking. It would argue that regardless of the normal nature of the content of intrusions their arrival on the scene in the obsessional case is as a result of a faulty inductive inference (O'Connor, 2002). There is some evidence that inductively generated inferences differentiate OCD patients from GAD groups and normal controls (Péllisier & O'Connor, 2002).

Then, the basic difference between an inference based approach to OCD and other cognitive approaches appears to be where one places the origin of obsessions: in the imagination or in "normal" intrusive cognitions. The implication of the former model is that both the primary inferences and their ensuing feared consequences are part of a running narrative characterized by inferential confusion. In the latter case a sharp distinction is made between intrusive cognitions and appraisal processes. Exaggerated reactions to the (possible) occurrence of intrusive thoughts may very well be relevant in the sense that cognitive elaboration on thoughts that could possibly occur may further detract the person from the normal stream of

consciousness and strengthen the reality value of the obsession. However, an inference based approach would insist that these reactions only exist by virtue of the erroneous meta-cognitive thought that the thought has occurred. Also, cognitive appraisal domains as identified by the OCD Working Group (2001) such as a need for certainty, feelings of responsibility, attaching importance to thoughts and wanting to control thoughts appear to be a quite natural consequence of an erroneous meta-cognitive thought such as "I may engage in harm to myself or others", and perhaps even at times a proper reaction, were it not that the initial belief that there is some sort of danger to oneself or others is mistaken. In other words, non-OCD patients may not react differently from OCD patients given the presence of a fearful inference that is generated by a convincing narrative characterized by inferential confusion. Thus, the inference based model would identify peculiarities in the reasoning process that gives rise to the initial obsessional inference. Specifically, inferential confusion as applied in obsessions without overt compulsions would propose that thought-thought fusion (confusing an imaginary thought with an actual thought) is a central process characterizing the reasoning that gives rise to obsessions. It would predict that where there is confusion about what is and what could be, this is the product of a narrative whose plot is idiosyncratic and not *necessarily* related to more general appraisals domains and fixed schema. Thus, educating the patient and unraveling this confusion should alleviate both anxiety and obsessional thinking.

Chapter 10

Conclusion

Overview of current findings

The current thesis started out with several goals and aims in an attempt to answer some of the claims brought forward by an inference based approach. In order to succinctly investigate the role of inference processes in OCD we have defined inferential confusion as a process characteristic where the person tends to dismiss objective evidence coming through the senses, distrust the senses, and engage in an inverse type of reasoning where thinking takes precedence over the senses. This led to the development of a questionnaire (The Inferential Confusion Questionnaire) measuring reasoning processes, and a systematic investigation of the concept of inferential confusion in a series of psychometric studies. To what extent have these studies contributed to an understanding of inference processes in OCD?

To answer this question we can broadly divide the work presented in this thesis in the following areas: (1) The measurement of inferential confusion; (2) Inferential confusion and obsessive-compulsive symptoms; (3) Inferential Confusion as a construct in obsessive-compulsive disorder and other disorders; (4) Inferential confusion and obsessive-compulsive beliefs; (5) Inferential confusion as a non-phobic characteristic of OCD; (6) Inferential confusion and treatment outcome.

The measurement of inferential confusion

The initial measurement of inferential confusion was carried out in a study by Emmelkamp & Aardema (1999) comparing the predictive validity of cognitive variables in obsessive-compulsive symptoms. In this study, items were written to capture crucial aspects of inferential confusion where most of the items reflected inverse inference and a tendency to distrust the senses, which led to the first version of the Inferential Confusion Questionnaire (ICQ). A significant portion of the items revolved around inferential confusion pertaining to threat related information (i.e. "Even if I have all sorts of evidence against the occurrence of a certain danger, I still feel it will occur"), since obsessions often refer to threat in one way or another, and as noted by Clark (2002) "...it is difficult, if not impossible to define or measure other cognitive domains in isolation from threat". An alternative solution to avoid any reference to threat in the items would have been to specifically refer to obsessions in the questionnaire, or prime the person in the instruction towards linking the items in the questionnaire to inferences or 'intrusions' as has been done in other cognitive measures (Salkovskis, Wroe, Gledhill, Morrison, Forrester, Richards, Reynolds, & Thorpe, 2000), but this would likely have led to an artificial inflation as to the importance of inferential confusion in OCD. Thus, while the reasoning distortions such as those reflected in the initial items set of the ICQ are wound up with threat, they contain the element of inferential confusion that leads the person to persist in his/her preoccupation despite contradictory evidence coming through the senses.

The reliability of the initial version of the ICQ was adequate in the study of Emmelkamp & Aardema (1999), but no efforts were made to investigate the dimensional structure of the questionnaire and the scale only contained eight items. Therefore, eleven additional items were conceived to capture the construct of inferential confusion for a second study in another community sample (n=108) (Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004). Factor analyses followed by oblique rotation revealed one large first factor explaining 30.1% of the variance with an eigenvalue of 5.9. This result was consistent with current conceptualizations, since the questionnaire attempted to measure a crucial sub-aspect of inferential confusion (i.e. 'inverse inference'), which was expected to be a unidimensional construct. A total of four items were removed with the lowest factor loadings, resulting in a unidimensional questionnaire of 15 items. In particular, as compared to the previous version the reliability improved with

Conclusion

the addition of new items (Cronbach alpha = 0.85). However, a limitation of these studies was the use of a normal populations, and further steps were taken to investigate the ICQ in a clinical OCD sample.

The final study investigating the psychometric properties of the ICQ was carried out in a clinical OCD sample (Aardema, O'Connor, Emmelkamp, Marchand, Todorov, 2004). In order to further improve the psychometric properties of the ICQ an additional 5 items were written, and 5 items with the lowest factor loadings in the previous study were removed. Factor analyses with oblique rotation on this latest itemsset once again revealed one large factor explaining 41.5% with an eigenvalue 5.8, which confirmed the unidimensional structure of the Inferential Confusion Questionnaire in a clinical OCD sample. No items were removed, which resulted in the final 15-item version of the Inferential Confusion Questionnaire (see appendix I). The final version showed an excellent internal reliability of .90 (Cronbach's alpha). In conclusion, the Inferential Confusion Questionnaire is a reliable, unidimensional measure of inferential confusion as established in two community samples and one clinical OCD sample. High scores indicate a reasoning process where the person persists in the possibility of threat or danger, despite evidence to the contrary, or without actual proof for its occurrence.

Inferential confusion as a construct in obsessive-compulsive disorder

The relevancy of inferential confusion to obsessive-compulsive behaviour was established in several studies with both non-clinical and clinical samples which consistently found moderate to strong relationships with obsessive-compulsive symptoms (Emmelkamp & Aardema, 1999; Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004; Aardema, O'Connor, Emmelkamp, Todorov, 2004). However, relationships between cognitive measures and obsessive-compulsive symptoms have been found to be wound up with negative mood states, and zero-order correlations may misrepresent the actual relationship (OCCWG, 2002). Indeed, inferential confusion was found to have moderate relationships with neuroticism, anxiety and depression in both the non-clinical and clinical samples.

Another issue is the potential overlap among cognitive measures, which complicates interpretation of results. However, the initial study carried out by Emmelkamp & Aardema (1999) in a non-clinical sample showed inferential confusion to be related to most forms of obsessive-compulsive behaviours while controlling for depression and 13 competing cognitive

Conclusion

domains. In particular, inferential confusion was independently related to the impulses, rumination, checking subscales of the Padua-revised. In another study in a non-clinical sample (Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004) inferential confusion was found to be related to all subscales of the Padua-Revised (Van Oppen, Hoekstra & Emmelkamp, 1995) while controlling for neuroticism – a personality variable that has been found to be wound up with other cognitive measures (Aardema, 1996). While no other cognitive measures were included in this study as controls, the study emphasizes the resiliency of the inferential confusion using a personality variable (neuroticism) as a control rather than anxiety and depression. The final study in a clinical OCD sample using the Padua Washington State Inventory (Burns, Keortge, Formea, & Sternberger, 1996) showed inferential confusion to be significantly related to obsessive-compulsive symptoms, while controlling for anxiety, depression and six belief domains as measured by the OBQ, thereby further confirming its relevancy to OCD independently of negative mood states and other cognitive measures. With these controls, inferential confusion was related to obsessive-compulsive overall as measured by the PI-WUSR total score, obsessions about harm and washing compulsions. In particular, the relationship with obsessions about remained quite substantial.

However, comparing all the studies carried out with the ICQ reveals some inconsistencies in the relationship between inferential confusion and specific obsessive-compulsive symptoms. While the initial studies of in non-clinical samples found inferential confusion to be related to checking compulsions after controlling for other variables (Emmelkamp & Aardema, 1999; Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004), no relationship was found with checking compulsions in the clinical OCD sample using similar controls (Aardema, O'Connor, Emmelkamp, Todorov, 2004). Similarly, there was a relationship between inferential confusion and washing compulsions in the clinical OCD sample while controlling for negative mood states and other cognitive measures, while no such independent relationship was found in the study of Emmelkamp & Aardema (1999). This points towards some inconsistencies as to the role of inferential confusion in the area of compulsive behaviours.

Obsessional impulses is another area of specific obsessive-compulsive symptoms where we find some inconsistencies in the relationship with inferential confusion. Inferential confusion was moderately related to obsessional impulses in the studies using the Padua-Revised (Van Oppen, Hoekstra & Emmelkamp, 1995) in the non-clinical samples, while no

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relationship was found with the impulses scale of the Padua-Washington State University Revision (PI-WSUR; Burns, Keortge, Formea & Sternberger, 1996) in the clinical samples. However, this subgroup of OCD patients may be underrepresented in general samples of OCD patients, which may have attenuated results. Also, inspection of the items in the PI-WSUR impulse scale showed that they do not seem to reflect obsessional impulses or thoughts, but rather seem to represent a generalized type of impulsivity. This is corroborated by the finding that the obsessional impulses scale in the Padua Washington State Inventory shows the least amount of specificity in differentiating OCD patients from anxious controls (Aardema, O'Connor, Emmelkamp, Todorov, 2004).

In sum, it appears that inferential confusion is related to most obsessive-compulsive symptoms while controlling for a wide variety of other cognitive measures and negative mood states. In particular, inferential confusion is strongly related to obsessions, which is consistent with an inference based approach that primarily attempts to account for the occurrence and persistence of obsessions.

Inferential confusion as a construct in OCD and other disorders

What evidence is there that inferential confusion is specific to OCD? The only study that addressed this question so far found that OCD patients score significantly higher on inferential confusion than anxious and non-clinical controls (Aardema, O'Connor, Emmelkamp, Marchand, Todorov, 2004). The inclusion of a delusional disorder sample in this study showed the same results, which scored as high on inferential confusion as the OCD group. This is consistent with a conceptualization of OCD as a belief disorder, which locates OCD in a different spectrum of disorders than those of the anxiety disorders. However, people with anxiety disorders also score higher on inferential confusion than non-clinical controls, and this suggests that inferential confusion may operate in different degrees in a variety of disorders, even though most prominently present in OCD. Of course, the tendency of anxious controls to score higher than non-clinical controls on any clinical cognitive measure is not surprising, and inferential confusion does show specificity to OCD as compared to anxiety disorders, but the extent of this specificity is unlikely to lead to a satisfactory classification of disorders on the basis of scores on inferential confusion. Indeed, post-hoc analyses using a cut-off score of 43.5 showed 67.5% of OCD patients and 57.7% of anxious patients were correctly classified.

Conclusion

Inferential confusion as a non-phobic characteristic of OCD

According to the IBA model OCD primarily follows a non-phobic model of development. The tendency to remove oneself from the senses, and reach inferences on the basis of purely subjective information, may be a characteristic that is shared among OCD patients and the schizotypal disorders. This is corroborated by the finding that individuals with Delusional Disorder score as high or higher on inferential confusion (Aardema, O'Connor, Emmelkamp, Todorov, 2004). Also, inferential confusion was related to several schizotypal symptoms, including perceptual disturbances and delusional thinking (Aardema, Kleijer, Trihey, O'Connor, Emmelkamp, 2004). However, inferential confusion is not related to obsessional conviction even though perhaps particularly relevant to this subgroup in terms of treatment outcome (Aardema, Emmelkamp & O'Connor, 2004; O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry Todorov, Trembley, Pitre , 2004).

While the relationship between obsessive-compulsive and schizotypal symptoms has been noted before (Enright & Beech, 1990; O'Dwyer & Marks, 2000), there is currently no coherent conceptualization of these relationships. In particular, how to conceptualize the relationship between perceptual disturbances and obsessive-compulsive symptoms, especially since OCD patients appear to have no problems with perceiving reality? The role of perceptual disturbances is, however, consistent with inferential confusion characteristics of OCD where the person removes him/herself from reality to such an extent, that although reality continues to be perceived correctly, certain disturbances in reality perception may start to occur as the person removes himself from it. This has been identified by O'Connor & Aardema (2003) as a cross-over point from reality into the imagination where the person starts to rely solely on imaginary criteria to determine a state of affairs in reality. In this sense, it is particularly noteworthy that inferential confusion interacts with perceptual disturbances in the production of OCD symptoms. This result can be viewed as the point where the obsessional inference starts to be 'lived' as real accompanied by high degrees of absorption into an imaginary reality, and as the endpoint of the inferential confusion process where the person confuses an imaginary possibility.

Inferential confusion and obsessive-compulsive beliefs

The relationship between inferential confusion and obsessive-compulsive beliefs is a complicated issue that has been specifically

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addressed in one study investigating the whether inferential confusion could account for most of the relationships between beliefs and obsessive-compulsive symptoms (Aardema, O'Connor, Emmelkamp, 2004). According to the inference based model, some appraisals and beliefs may follow logically from the obsessional primary inference. It would then naturally be expected that inferential confusion would show a relationship with these obsessive-compulsive beliefs and appraisals. Indeed, inferential confusion is quite strongly related to some obsessive-compulsive beliefs (overestimation of threat and responsibility), and shows moderate correlations with other beliefs. However, at the same time some of a these relationships threaten the divergent validity of inferential confusion, in particular with respect to overestimation of threat, which showed the strongest relationship with inferential confusion. Yet, clearly, inferential confusion remains significantly related to several forms of obsessive-compulsive symptoms when controlling for these other cognitive domains, (Emmelkamp & Aardema, 1999, Aardema, O'Connor, Emmelkamp, Todorov, 2004), and thus we can surmise that inferential confusion is a process that operates independently from other cognitive domains despite its relationship with these domains. However, most crucially, the hypothesis that inferential confusion is a marker of OCD that takes *precedence* over obsessive-compulsive beliefs, needs not only to show its independent relationship with obsessive-compulsive symptoms, but an ability to accommodate the relationships between beliefs and obsessive-compulsive symptoms. Indeed, the relationships between obsessive-compulsive beliefs as measured by the OBQ-44 almost completely disappear when controlling for inferential confusion. This provides strong evidence as to the unique role of inferential confusion in the development of obsessive-compulsive symptoms and its precedence over belief domains. An exception appears to be the scale perfectionism/intolerance to uncertainty, which remained significantly related to several obsessive-compulsive symptoms. However, this cognitive domain has not shown to be specific to OCD in comparative studies of OCD patients and other anxiety disorders, and should most likely be viewed as an important cognitive marker for anxiety disorders in general (Taylor, 2002).

In the same study that found inferential confusion could largely account for the variance between obsessive-compulsive beliefs and obsessive-compulsive symptoms, a competing hypothesis was proposed that argued that the overlap between overestimation of threat and inferential confusion could account for these findings (Aardema, O'Connor, Emmelkamp, 2004). The the overlap between inferential confusion and

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overestimation of threat may indicate that controlling for inferential confusion means controlling for overestimation of threat as well. However, factor analyses with varimax rotation on the item set of the ICQ and the scale overestimation of threat appeared to indicate otherwise. Not only were overestimation of threat and inferential confusion distinct factorial domains, the relationship of each of these factors with obsessive-compulsive symptoms while controlling for anxiety and depression, once again showed that the construct inferential confusion continued to be related to obsessive-compulsive symptoms, while no significant relationships were found between overestimation of threat and obsessive-compulsive symptoms when controlling for these negative mood states. In sum, the results of these studies appear to indicate that inferential confusion is an independent process that accommodates the relationships between belief domains and obsessive-compulsive symptoms.

Inferential confusion and treatment outcome

Therapy specifically targeting inferential confusion has been shown to enhance treatment outcome for those individuals with a high obsessional conviction (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre, 2004). In particular, such individuals benefit more from inference based therapy than conventional cognitive behavioural therapy. More recently, a study by Aardema, Emmelkamp & O'Connor (2004) found that changes in inferential confusion as measured by the Inferential Confusion Questionnaire was significantly related to treatment outcome in a sample of OCD patients receiving traditional cognitive-behavioural therapy without specifically targeting inference processes in treatment. Thus, it appears that changes in inferential confusion may be an important cognitive ingredient for treatment success regardless of treatment modality. This would be consistent with a conceptualization of inferential confusion as general meta-cognitive confusion operating on a continuum from obsessional doubt to certainty. Indeed, inferential confusion was not related to obsessional conviction in primary inferences, nor found to be a predictor for poor treatment outcome.

Is inferential confusion a central marker in OCD?

The studies discussed in the previous section strongly suggest that inferential confusion plays an important role in OCD. However, what is the evidence in supports of the notion that inferential confusion is a central

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cognitive marker in OCD? There are a number of findings that appear to point in this direction, while some other findings indicate the need for further work. These can be briefly summarized as follows:

- 1) Inferential confusion is a cognitive variable that is related to most forms of obsessive-compulsive behaviours as compared to other cognitive variables (Aardema, O'Connor, Emmelkamp, Todorov, 2004; Emmelkamp & Aardema, 1999). In particular, inferential confusion is related to obsessive-compulsive symptoms overall as measured by the PI-WUSR total, and has a relatively strong relationship with obsessions. Both findings are consistent with an inference based approach that locates the focal point of the obsessional sequence in obsessions rather than its aftermath. However, the relationship of inferential confusion with other forms of OCD symptoms has shown some conflicting findings, in particular the relationship with compulsive behaviours. Thus, while the current results look promising with respect to obsessive-compulsive symptoms in general and the occurrence of obsessions about harm to self or others, further work may be needed to establish the relevancy of inferential confusion for all compulsions.
- 2) The concept of inferential confusion is surprisingly resilient to controls including a variety of cognitive variables and negative mood states. These results confirm the role of inferential confusion as an independent process operating in OCD. In addition, inferential confusion is able to accommodate the variance of other cognitive markers shared with obsessive-compulsive symptoms. The latter is perhaps one of the strongest research findings so far with the inferential confusion questionnaire. However, given the important implications of these findings, replication of these results is needed before more conclusive statements can be made.
- 3) Inferential confusion shows specificity to OCD and related disorders. The current findings indicate that OCD patients score significantly higher than those with other anxiety disorders (Aardema, O'Connor, Emmelkamp, Todorov, 2004), while individuals with delusional disorder score as high as OCD patients. However, anxious controls also score higher than non-clinical controls on inferential confusion, and classification of all of these groups on the basis of scores on the Inferential Confusion Questionnaire is not recommendable at this point. Thus, while the finding that OCD patients score higher than anxious

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controls is promising, further work may be needed to better distinguish OCD patients from anxious groups.

- 4) Therapy specifically targeting inferential confusion has been found to be particularly beneficial for a subgroup of OCD patients where obsessional conviction is high (O'Connor, Aardema, Bouthillier, Fournier, Guay, Robillard, Landry, Todorov, Trembley, Pitre, 2004).. Change inferential confusion as measured by the Inferential Confusion Questionnaire is also associated with change in obsessive-compulsive symptoms in a general sample of OCD patients receiving traditional cognitive-behavioural therapy not specifically targeting inference processes (Aardema, Emmelkamp, & O'Connor, 2004). It may be that change in inferential confusion as measured by the Inferential Confusion Questionnaire will have a greater impact on symptoms for those with higher obsessional conviction than for those with lower conviction levels, but so far, inferential confusion appears an important cognitive variable associated with change in symptoms for the majority of OCD patients receiving therapy.

While these results appear very promising in many regards, it is too soon to tell whether or not inferential confusion is a central marker in OCD. First and foremost, current results require replication, and further work is needed in several areas as described above. Also, there are certain limitations to psychometric research, and for any cognitive marker to be considered central to OCD, experimental data is required to support this position. However, as far as psychometric methods permit, the current results strongly support inferential confusion as an independent process, and perhaps as a central marker in OCD.

Future directions

The studies carried out for this thesis have advanced the measurement and empirical evidence for a role of inferential confusion in OCD. However, the concept of inferential confusion needs further work in a number of areas such as its relationship with all compulsive behaviours, and enhancing the specificity of the concept of inferential confusion to obsessive-compulsive symptoms. In this regard, it should be noted that the current measurement of inferential confusion with the Inferential Confusion Questionnaire focuses on one subaspect of inferential confusion, namely a distrust of the senses and inverse inference, while there may be other

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processes that lead to inferential confusion as identified by O'Connor and colleagues. In particular, the role of irrelevant associations, category errors, selective use of acts, and individual levels in absorption that leads the person to live the obsession as a reality (imaginary sequences). Further work is currently ongoing in an expansion of the Inferential Confusion Questionnaire to include these concepts in the questionnaire in order to identify other underlying dimensions of inferential confusion. This expansion may also aid in further differentiating the inferential confusion questionnaire from the concept of overestimation of threat, and while these constructs can be empirically distinguished, it would be preferable to also separate both concepts more clearly in terms of questionnaire content.

The multidimensional investigation of cognitive variables in OCD remains a challenge even with the use of partial correlations to establish unique variance of cognitive measures with obsessive-compulsive symptoms, since these correlations do not completely eliminate competing hypothesis'. In this regard, some of the methods used in the study of Aardema, O'Connor, Emmelkamp (2004) may be promising. In this study, the item set of the ICQ and overestimation of threat scale (OBQ) were subjected to factor analyses with varimax rotation, which produced independent constructs. The benefit of generating psychometrically unrelated constructs is that it allows for more conclusive statements about the unique variance that these constructs share with obsessive-compulsive symptoms. However, a drawback of this research may be that a considerable amount of power is needed when investigating a large number of cognitive domains.

Another important area for future research is to link psychometric data to experimental methods investigating of the concept of inferential confusion. In this respect, it is encouraging to report that there have been some important advances in the operationalization of doubt and the experimental manipulation of inferential confusion (Aardema, Pelissier, O'Connor, ongoing project). Since inferential confusion primarily deals with a confusion between reality and possibility, OCD patients as compared to other clinical populations, would be expected to react in different proportions to reality and possibility based information in reaching a conclusion about a probable state of affairs. In particular, it would be expected that OCD patients are particularly susceptible to the negating influence of possibility based information in inferring a state of affairs in reality. Experimental manipulations by introducing reality and possibility based information to

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participants may reveal important differences in how a person comes to doubt reality and belief in a probable state of affairs that negates reality.

In this regard, of particular interest for future investigations is the relationship between inferential confusion and imaginative processes operating in OCD (O'Connor & Aardema, 2002). Inferential confusion occurs when a person mistakes an imagined possibility for a real probability. This confusion may occur briefly under conditions of perceptual ambiguity where imagination may overlap with perception. However, inferential confusion becomes pathological when the person crosses over from the real into the imaginary, treating the imagined possibility "as if" it were real .

It is suggested that inferential confusion is a process characterising, in different degrees, obsessive compulsive disordered thinking, and that as a process it may account parsimoniously for a variety of "fusion" experiences, particularly where the imagination plays a decisive role in rendering non-existent events or feelings more probable (ex.: imagining myself ill makes falling ill more probable). The inferential confusion process starts with the person inferring a possible state of affairs, "this object might be contaminated", "I could kill my child". This possible state is only postulated not actual, but the person then acts "as if" the possible event or impulse was actually likely to occur. Imaginary possibilities are distinguished from real probabilities not necessarily by their content but by their inferential context where plausibility is inferred not from an objective assessment of probability but entirely on the basis of a subjective narrative. The inferential confusion model proposes that there is a critical point when the person with obsessive compulsive disorder crosses over from the real world of perception into the imagination. This crossover point is identifiable and is reported by clients as a transition from reality to non-reality, sometimes accompanied by different degrees of derealization. This crossover point represents the start of the obsessional process since the obsessional anxiety springs from this meta-cognitive confusion (thinking that an imagined thought or event has a reality value). The subsequent compulsive rituals, neutralization, coping strategies, also result from a confusion that acting in reality can change imagined consequences.

Imagination, in this model, is considered an autonomous faculty operating in parallel with perception with some normal overlap (see Figure 1a), but which processes possibilities rather than reality (O'Connor & Aardema, 2004). Whereas real probabilities are finite, imaginary possibilities are infinite. So the person who confuses the imaginary for the real is likely to

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be trapped in a spiral of interminable “maybes”, chaining on one from another, but with no reality check, since imagination has replaced reality.

In sum, all of these future goals look promising with respect to further enhancing our understanding of OCD, in particular with respect to the measurement and role of inference processes in OCD.

A final comment

Several authors agree that specificity of cognitive domains is key to an understanding of obsessive-compulsive disorder, and it has been suggested that further work is needed in identifying specific obsessive-compulsive beliefs (Steketee, Frost, Wilson, 2002, Taylor, 2002). If the cognitive specificity hypothesis of Beck in terms of specific dysfunctional beliefs is correct, then indeed we would be wise to continue searching for beliefs that are specifically relevant to OCD. However, what proof do we have that this belief domain will ever be found? The studies outlined in this chapter raise a number of concerns regarding the current route of cognitive-behavioural theories in attempting to identify specific beliefs in this disorder.

An inference based approach would argue that research into OCD has taken a few questionable turns in the last few decades. In particular, the emphasis on similarities between obsessions and intrusive cognitions may have been taken too far, and although to a certain extent there may be similarities in content between intrusive cognitions and obsessions, there may be important differences in form and context. Another point of contention is the application of Beck’s model exclusively focusing on specific beliefs at the expense of clinical process characteristics operating in OCD. Clearly, the application of Beck’s model of psychopathology has advanced clinical psychology to a considerable degree, but the cognitive specificity hypothesis in terms of beliefs may not apply to all disorders.

The inferential confusion model provides an alternative cognitive approach to OCD that accommodates idiosyncratic mental content in OCD, yet at the same time, identifies common characteristics in this disorder in terms of processes or cognitive distortions. Whatever the merits of an inference based approach, the current results suggest that there are important processes operating in OCD that have been ignored in other cognitive models of OCD, and that an approach focusing on these processes may have more specificity than other cognitive approaches.

However, it is too soon for any conclusive statements, and in particular, there is a need to replicate current findings. Despite these considerations, it should be recognized that inferential confusion as measured by the

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Inferential confusion Questionnaire has been subjected to a large number of systematic controls. While replication of the current studies should certainly be welcomed, it would perhaps also be appropriate to subject other cognitive measures to the same type of controls as has been applied to the concept of inferential confusion.

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Appendix

Please rate your agreement or disagreement (1-5) with the following statements using this scale:

<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

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

SAMENVATTING

Een recent cognitief model benadrukt redenering processen als een belangrijk element in de ontwikkeling en instandhouding van obsessies en compulsies. In dit redeneringmodel worden obsessies gezien als het resultaat van specifieke redeneringsprocessen. In een redeneringmodel van de obsessieve-compulsieve stoornis wordt een intrusie of obsessie gezien als een *gevolgtrekking* die tot stand komt op basis van 100% subjectieve informatie. In tegenstelling tot normale gevolgtrekkingen, is er in een *obsessieve* gevolgtrekking sprake van een conclusie zonder enig bewijs in de realiteit. Dit redeneringproces is ook wel beschreven als 'inverse inference' ofwel een omgekeerd redeneringproces waar iemand niet begint met observatie om tot een gevolgtrekking te komen, maar begint met de gevolgtrekking die niet op enige observatie is gebaseerd. Uiteindelijk leidt een dergelijke wijze van redeneren tot 'inferential confusion' waarbij sprake is van verwarring tussen de realiteit en de verbeelding, omdat dit redeneringproces er toe leidt dat de persoon met een obsessief-compulsieve stoornis er vanuit gaat de obsessieve gevolgtrekking daadwerkelijk iets te maken heeft met de realiteit in het hier en nu.

Het huidige proefschrift beschrijft de ontwikkeling en validering van een vragenlijst ('The Inferential Confusion Questionnaire') in een serie studies ter identificatie van redeneringprocessen die aanleiding geven tot dwangsymptomatologie en beschrijft het belang van deze redeneringprocessen voor de behandeling van dwangstoornissen. De doelstellingen van het proefschrift zijn de volgende:

- 1) De ontwikkeling van een vragenlijst ter meting van redeneringprocessen (n.l. 'inferential confusion')
- 2) Het onderzoeken van het belang van inferential confusion voor de obsessief-compulsieve stoornis.
- 3) Het vaststellen van de unieke relevantie van inferential confusion, onafhankelijk van andere cognitieve variabelen.
- 4) Onderzoek naar inferential confusion als een centrale cognitieve variabele in de obsessief-compulsieve stoornis.
- 5) Onderzoek naar de effecten van cognitieve-gedragstherapie op inferential confusion.

De eerste studie (Hoofdstuk 2) is een exploratieve studie in een niet-klinische populatie waar de predictieve validiteit van het concept inferential confusion voor obsessief-compulsieve symptomen vergeleken wordt met die

van een aantal andere cognitieve variabelen. De resultaten tonen aan dat de meeste cognitieve domeinen zijn gerelateerd aan specifieke dwangsymptomen, terwijl inferential confusion onafhankelijk is gerelateerd aan een veelvoud van obsessief-compulsieve symptomen. Met andere woorden, in tegenstelling tot andere cognitieve domeinen lijkt inferential confusion relevant voor obsessief-compulsieve symptomatologie onafhankelijk van de vorm welke deze symptomen aannemen. Dit bleek tevens het geval wanneer de relatie tussen inferential confusion and obsessief-compulsieve symptomen werd onderzocht en gecontroleerd werd voor depressieve stemming.

Hoofdstuk 3 beschrijft de verdere ontwikkeling en validering van een schaal om het concept inferential confusion te meten in een niet-klinische populatie, waarbij de relatie met schizotypische en obsessief-compulsieve symptomen wordt onderzocht. De resultaten tonen een relatie aan tussen inferential confusion en schizotypische symptomen (perceptuele stoornissen en waan symptomen), gecontroleerd voor neuroticisme. Deze resultaten lijken aan te geven dat inferential confusion tevens van belang is bij waanstoornissen en ondersteunen het idee dat niet-fobische elementen mogelijk een belangrijke rol spelen in de ontwikkeling en instandhouding van dwangklachten.

Hoofdstuk 4 and 5 beschrijven de uiteindelijke versie van de Inferential Confusion Questionnaire, gevalideerd in drie klinische en een niet-klinische populatie. De resultaten geven aan dat redeneringprocessen significant gerelateerd zijn aan dwangsymptomatologie in verscheidene niet-klinische en klinische groepen, gecontroleerd voor angst en depressie. De relatie met dwangsymptomen blijft substantieel wanneer er wordt gecontroleerd voor andere cognitieve domeinen, terwijl de relatie van deze cognitieve domeinen met dwangsymptomatologie voor een groot deel verklaard kunnen worden door `inferential confusion`. Het specifieke belang van deze redeneringprocessen in dwangstoornissen blijkt uit de significante hogere score op inferential confusion door personen met een dwangstoornis in vergelijking met personen met een angststoornis. Het feit dat personen met een waanstoornis even hoog op inferential confusion scoren als personen met een dwangstoornis biedt verdere ondersteuning voor de studie van obsessief-compulsieve stoornissen vanuit een niet fobisch perspectief.

In hoofdstuk 6 wordt onderzocht in hoeverre verandering in inferential confusion gerelateerd is aan een succesvolle therapie-uitkomst. De resultaten bevestigden deze verwachting. Verandering in inferential

confusion gedurende therapie bleek positief gecorreleerd met verandering in obsessief-compulsieve symptomatologie. Echter, inferential confusion was niet gerelateerd aan een negatieve therapie uitkomst. Met andere woorden, een hogere score op inferential confusion vóór therapie voorspelt niet of een persoon een betere uitkomst heeft gedurende therapie. Of specifieke therapeutische interventies gericht op redeneringprocessen mogelijk leiden tot betere uitkomsten met cognitieve-gedragstherapie voor dwangstoornissen, dient onderzocht te worden.

Hoofdstuk 7 beschrijft de laatste theoretische ontwikkelingen in een redeneringmodel voor het begrijpen van obsessies zonder compulsies. Hier wordt beargumenteerd dat de obsessies zonder compulsies het beste kunnen worden begrepen als meta-cognitieve gedachten die tot stand komen op basis van irrelevante informatie en niets te maken hebben met een persoon's normale (cognitieve) gedachtestroom. Dus op dezelfde manier als een persoon tot een incorrecte gevolgtrekking kan komen met betrekking tot de realiteit kan een persoon tot een incorrecte conclusie komen met betrekking tot zijn/haar eigen binnenwereld. Dit is kenmerkend voor obsessies zonder compulsies (geweld, seksualiteit, godslastering, etc). Een dergelijke conceptualisering heeft theoretische en therapeutische implicaties. Er wordt beargumenteerd dat de wijze waarop de obsessieve gevolgtrekking tot stand komt mogelijk van groter belang is dan de wijze waarop een persoon deze incorrecte meta-cognitieve gedachten interpreteert.