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Part 2. They scare because we care: The relationship between obsessive intrusive thoughts and appraisals and control strategies across 15 cities ☆

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ABSTRACT

Cognitive models of Obsessive Compulsive Disorder (OCD) purport that obsessions are normal intrusive thoughts that are misappraised as significant, leading to negative emotional responses and maladaptive attempts to control the thoughts and related emotions. This paper utilised a large multi-national dataset of interview data regarding intrusive thoughts, to investigate three questions related to the cognitive model of OCD and to its stability across cultures. First, the paper aimed to investigate the implicit yet-hitherto-untested assumption of cognitive models that misappraisals and control strategies for intrusive thoughts relate similarly across cultures. Second, this study aimed to build upon recent studies categorising intrusive thoughts into repugnant and non-repugnant categories, by investigating whether

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The group as a whole was Chaired by Author Clark and Co-Chaired by Author Radomsky. Authors Radomsky, Abramowitz, Belloch, Bouvard, Clark, Coles, Doron, Moulding, Shams, Sica, Simos, and Wong designed the study and the protocol. All authors tested participants. Author Alcolado conducted preliminary data screening and author Moulding conducted the statistical analyses. Authors Moulding and Coles wrote the first draft of the manuscript with subsequent contributors listed alphabetically. All authors contributed to and have approved the manuscript. All authors have no conflicts of interest pertaining to the present manuscript.

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the content of intrusive thought moderates the relationship between the thoughts and appraisals and control strategies. Finally, this study aimed to provide further evidence regarding whether general beliefs implicated in cognitive models of OCD (e.g., responsibility, importance of thoughts) influence the occurrence of intrusions via maladaptive appraisals and control strategies. Overall, it was found that while overall intrusive thought frequency, distress, ease and importance of dismissal all varied significantly by site, their relationship with appraisals and control strategies did not. Generally, appraisals and action taken to confront the thought were the more consistent predictors, with the notably caveat that the relationship between thought frequency and appraisals was not strong. Second, repugnant vs. non-repugnant thought-content differed only with respect to thought frequency, but thought-content did not moderate the relationship between intrusive thoughts and control strategies and appraisals. Finally, appraisals and control strategies generally partially mediated the relationship between general OCD-related beliefs and the occurrence of, and distress associated with, intrusive thoughts. The results are taken to add credence to cognitive models of OCD and their validity across cultures.

1. Introduction

It is now well accepted that the occurrence of Obsessive Compulsive Disorder (OCD) is not restricted to a specific culture or particular era (de Silva, 2006; Nedeljkovic, Moulding, Foroughi, Kyrios, & Doron, 2012). Cultural and geographically-diverse clinical and epidemiological data have shown remarkable consistency both with respect to the presence and to the characteristics of OCD symptoms (for review, see Nedeljkovic et al., 2012). Cognitive models of OCD suggest that the construction of meaning and interpretations of common intrusive phenomena play large roles in the development and maintenance of specific obsessive and compulsive symptoms (e.g., Clark, 2004). As meaning construction itself varies cross-culturally – how one perceives oneself, one's body, and one's health, along with how one defines constructs such as disorder and normality, and how one conducts social interactions (e.g., Fabrega, 1989; Marsella & Yamada, 2000; Marsella, Kaplan, & Suarez, 2002) – culture might be important both in determining the manifestation of OCD symptoms and in influencing their underlying mechanisms.

1.1. Culture and cognitive appraisal models of OCD and the interpretation of intrusions

Current cognitive appraisal models of OCD are based on findings that intrusive thoughts, images and urges – distinct, identifiable cognitive events that are unwanted, unintended, and recurrent – are experienced by the majority of the population (e.g., Rachman & de Silva, 1978; Salkovskis & Harrison, 1984; cf. Rassin & Muris, 2007). The characteristics of intrusive thoughts include that they interrupt the normal flow of thoughts, interfere in task performance, are associated with negative affect, and are difficult to control (Clark & Rhyno, 2005). It is posited that normal intrusions escalate into clinical obsessions when the intrusions are misinterpreted as important and meaningful, leading to maladaptive control attempts to confront or avoid the thought (e.g., thought suppression; compulsions), which can serve to increase the salience attributed to the thoughts or the occurrence of the thoughts themselves (e.g., Clark, 2004; Salkovskis, 1985).

Authors such as Rachman (1993, 1997, 1998) have emphasized the importance of the content of intrusive thoughts in the development of obsessions, noting that intrusions which relate to themes from the major moral systems (e.g., sex, aggression, blasphemy) are more likely to be misinterpreted as being significant, personally revealing, or threatening. Freeston and Ladouceur (1998) noted that "It is no coincidence that we typically see harming obsessions among gentle people, religious obsessions among religious people, thoughts about sexuality among highly moral people, and thoughts about mistakes among careful people: the more important something is, the worse it seems to have a thought about it." (p. 141; see also Aardema et al., 2013; Moulding, Aardema & O'Connor, in press). Thus, it follows that since moral concerns and other matters of emphasis (e.g., cleanliness, religion, sexuality) differ cross-culturally, the intrusive thoughts that are interpreted by individuals as being most meaningful may also differ between cultures. Indeed, even within a particular culture, specific social and environmental concerns differ over time, which are often reflected in the nature of individuals' preoccupations. For example, de Silva (2006) noted that in OCD patients in the United Kingdom, over the previous two-to-three decades, contamination fears had shifted from fears of asbestos to fears of HIV/AIDS. In sum, one's culture and personal background may influence the specific themes of obsessions or preoccupations experienced by impacting interpretations of intrusive thoughts.

A limited number of empirical studies have looked more generally at the relationship between intrusions, control strategies, and appraisals (for review, see Clark & Purdon, 1995; Clark & O'Connor, 2005). The most OCD-relevant of these have used Purdon and Clark's (1993) Obsessive Intrusive Inventory, or revisions of it, in Canadian (Purdon & Clark, 1994a, 1994b) and Spanish samples (Belloch, Morillo, Lucero, Cabedo, & Carrio, 2004; García-Soriano & Belloch, 2013). In these studies, it was consistently found that thought frequency was associated with beliefs or worries that the thought would come true, and perceptions of the uncontrollability of the thoughts (Belloch et al., 2004; Purdon & Clark, 1994a, 1994b). Further, there was also consistency in findings across studies that the unpleasantness of the thoughts was not related to thought frequency (Belloch et al., 2004; Purdon & Clark, 1994a, 1994b). The similarity in findings across the two cultures (Canadian and Spanish) lends further credence to the findings. One minor difference was observed; the finding that thought frequency and the importance of controlling the thought were significantly associated in the Spanish sample (Belloch et al., 2004), but not in either of the Canadian samples (Purdon & Clark, 1994a, 1994b). With regards to control strategies, there was some evidence that overt and covert methods of neutralizing and distracting were related to the frequency of intrusions, but only one study has shown a relationship between thought frequency and self-reassurance or telling oneself to stop (Belloch et al., 2004; Purdon & Clark, 1994b). In summary, while cross-sectional, findings of these initial studies are broadly consistent with cognitive models that implicate appraisals in determining individuals' emotional responses to stimuli, albeit providing weaker evidence for the association of control strategies in leading to an escalation of thought frequency (cf. Clark, 2004). Given the limited number of OCD-relevant studies, firm conclusions are premature.

An implicit assumption of these studies, and of cognitive appraisal models of OCD, is that similar misinterpretations of intrusions and control strategies are related to the frequency and distress associated with intrusions across cultures. While research on the prevalence of OCD across cultures shows some consistency, there is limited data across cultures regarding the frequency and distress associated with intrusive thoughts, and on the relationship of such thoughts to appraisals and control strategies (see Nedeljkovic et al., 2012; Sica, Novara, Sanavio, Dorz, & Coradeschi, 2002). If there is consistency across cultures in the interrelationship between interpretations and OCD symptoms, there would be greater confidence in the applicability to non-Western settings of the cognitive-behavioural model of OCD that was largely developed in the West (Kyrios, Sanavio, Bhar, & Liguori, 2001). Therefore, the first aim of the present study was to examine possible cultural variations in how different aspects of intrusive thoughts (e.g., unpleasantness, frequency, importance of dismissal, ease of dismissal) are associated with appraisals of intrusions, and the control strategies used with them.

1.2. The importance of intrusive thought content

Recent studies suggest that the types of intrusive thoughts that individuals experience may be differentiable into two separate factors, with (1) religious, sexual and aggressive obsessions typically loading upon a single factor (e.g., Abramowitz, Franklin, Schwartz, & Furr, 2003; Baer, 1994; cf. Leckman et al., 1997; for a review, see McKay et al., 2004); while (2) washing/cleaning obsessions and checking obsessions load upon on another (Haslam, Williams, Kyrios, McKay, & Taylor, 2006; McKay et al., 2004). For example, in their study of normal intrusive thoughts, Purdon and Clark (1993) found a two factor structure in women (repugnant thoughts such as sex/aggression and non-repugnant thoughts such as dirt/contamination). While only a single factor was found for men, most of the dirt/contamination items were excluded due to low endorsement by male respondents (see Belloch et al., 2004). Belloch et al. and García-Soriano, Belloch, Morillo, and Clark (2011) found similar factors indicating (1) repugnant thoughts such as aggression, sexually and socially inappropriate behaviours; and (2) non-repugnant thoughts such as doubt, checking and cleanliness. Lee and Kwon (2003; study 1) found evidence for a two factor structure using Purdon and Clark's (1993) measure in a South Korean undergraduate sample using exploratory ($N=185$) and confirmatory ($N=185$) factor analyses, labeling the repugnant thoughts as autogenous obsessions ("self-generated"), while the non-repugnant obsessions were labeled as reactive obsessions. This division of obsessions was subsequently supported in a confirmatory factor analysis in an Australian undergraduate and community sample (Moulding, Kyrios, Doron, & Nedeljkovic, 2007). Lee and Kwon proposed that the two types of obsessions differ in terms of triggers, ego-dystonicity levels, perceived irrationality, and types of control strategies (overt confrontation vs. covert avoidant respectively; see also Lee, Kwon, Kwon, & Telch, 2005; Lee, Lee, Kim, Kwon, & Telch, 2005; Belloch, Morillo, & García-Soriano, 2007), and recent research has found that these two types of intrusions may have different neuroanatomical substrates (Subirà et al., 2013).

While intrusive thoughts have been differentiated into two factors in single-site studies, there is a lack of studies that have systematically compared whether the content of thoughts influences the relationship between intrusive thought aspects (frequency, unpleasantness, ease and importance of dismissal of thoughts) and appraisal and control strategy dimensions. Given the evidence for the two "classes" of intrusive thoughts, and their correspondence with traditional OCD symptom themes, it is of interest whether the type of intrusive thought influence is associated with the relationship between intrusive thought-related variables, and appraisals and control strategies. This was the second aim of the present paper.

1.3. Relationship of beliefs to intrusive thoughts

As is generally the case in cognitive theories, it is assumed that specific appraisals and resultant actions – in this case, appraisals of intrusive thoughts and resultant thought control strategies – reflect the presence of more general pan-situational beliefs, such as inflated responsibility and the importance of thoughts (see e.g., Obsessive Compulsive Working Group [OCCWG], 1997). Studies conducted in Western and non-Western countries have examined the relations between OCD symptoms, pan-situational beliefs, and appraisals and control strategies related to intrusive thoughts. Individuals with OCD have been found to be more likely than both anxious and non-anxious control participants to use the thought control strategies of worry and punishment (Abramowitz, Whiteside, Lynam, & Kalsy, 2003; Amir, Cashman, & Foa, 1997; Sica, Steketee, Ghisi, Rocco Chiri, & Franceschini, 2007) and also more likely than depressive patients to use punishment (Belloch, Morillo, & García-Soriano, 2009). Data from a non-Western sample (Turkey) also suggests an association between OCD and the use of strategies that may facilitate or reflect avoidance: in this case thought suppression (Yorulmaz, Karanci, Bastug, Kisa, & Goka, 2008). Broadly, control strategies such as worry, punishment, and thought suppression, are ineffective in that they may provide temporary relief but exacerbate symptoms in the long-run, and are thought to then be appraised as failures (Tolin, Abramowitz, Hamlin, Foa, & Synodi, 2002; Yorulmaz et al., 2008). Generally, ineffective control strategies and maladaptive appraisals may be pathways by which OCD-related beliefs lead to increases in the frequency and distress related to intrusions. Indeed, one study found that the control strategy of thought suppression mediated the relation between thought-action fusion and OCD-like symptoms (Marcks & Woods, 2007). This finding is in need of replication and broadening to incorporate other forms of appraisals and control strategies. Therefore, the final aim for the current study more generally aimed to test the extent to which appraisals of intrusions and control strategies mediate the relationship between more general beliefs and intrusions, using the advantage of a large cross-national data-set with interview-based data.

1.4. This study

In sum, as noted by Nedeljkovic et al. (2012), the current cognitive literature into OCD lacks a substantive understanding of cross-cultural differences in the processes related to intrusive thoughts and obsessional and compulsive symptoms. While there may be cross-cultural differences in related constructs such as morality, the understanding of cultural influences is lacking in terms of the appraisals and control strategies that occur in response to the unwanted intrusions. Furthermore, evidence for the influence of thought content on these relationships is lacking. Finally, more evidence is required regarding the relationship between beliefs, appraisals, control strategies and intrusions. As such, this study was designed to provide some answers to these issues through examining the association between various dimensions describing intrusive thoughts in non-clinical individuals (e.g., frequency, distress, importance to dismiss and difficulty dismissing), as assessed by interview, and appraisal and control strategies. First, it was assessed whether these relationships vary across 15 sites within 13 Western and non-Western countries (aim 1). We hypothesized that there would be differences across the sites, so allowing the relationships to vary by country would improve the statistical models. Second, it was hypothesised that the types of

thoughts (i.e., repugnant vs. non-repugnant) would influence the strength of such relationships (aim 2). Finally, it was hypothesised that appraisals and thought-control strategies would mediate the relationship between general beliefs and thought frequency, distress, importance and difficulty in dismissing (aim 3).

2. Method

2.1. Instruments

The International Intrusive Thoughts Interview Schedule-Version 6 (IITIS; Research Consortium on Intrusive Fear [RCIF], 2007; for detail see Radomsky et al., 2014)[1] is a semi-structured interview schedule used to assess an individual's experience of unwanted intrusive thoughts, images and feelings. Demographics and psychiatric history are also briefly detailed. In the interview, definitions of unwanted intrusive thoughts are given to participants, along with a number of intrusion examples from a variety of content domains. Subsequently, the interviewer gives descriptions and examples of intrusive thoughts from seven categories divided by content (contamination/dirt/disease; harm/injury/aggression; doubting; unwanted religious/immoral; unwanted sexual; being a victim of violence; other intrusions). Participants are asked, with respect to one intrusion category at-a-time, if they have experienced these thoughts in the last three months; and if so, they are asked to give a detailed description of the thought, along with rating its frequency, the distress it causes; the importance of dismissing the intrusion; and the difficulty of dismissing the intrusion.

In the second part of the interview, participants are reminded of the intrusive thoughts they noted, and asked to pick the single most distressing of the intrusions that had occurred. This thought is subsequently rated on eight appraisal dimensions, related to the common thought appraisals identified in previous research (e.g., Purdon & Clark, 1994a, 1994b; OCCWG, 1997), for example, estimations of threat; importance of thoughts; responsibility; and ego-dystonicity. Next, participants rate their use of ten control strategies similar to those in previous instruments (e.g., Freeston, Ladouceur, Thibodeau, & Gagnon 1991; Freeston & Ladouceur, 1993; Purdon & Clark, 1993, 1994a, 1994b) such as distract themselves, replace the thought, do nothing, and so forth. Finally, participants note appraisals related to any failures in thought control (e.g., threat appraisals; responsibility). Note that for the purpose of this paper, the most distressing thought content was classified on an *a priori* basis into repugnant obsessive thoughts (Harm/Injury/Aggression, Religious or immoral intrusions, sexual intrusions), and non-repugnant intrusions (contamination, doubt, victim). As being a victim of harm was conceptually closer to a "worry-like intrusion" as opposed to a repugnant intrusion about oneself (cf. Lee, Lee, et al., 2005), it was classified it as a non-repugnant intrusion, along with contamination and doubt. The IITIS was translated into the native language of the countries through standard back-translation procedures. Further detail regarding training and the IITIS is provided in the first article in this series (Radomsky et al., 2014).

The Obsessive Beliefs Questionnaire (OBQ-44; OCCWG, 2005) is a 44-tem measure of pan-situational beliefs implicated in the cognitive model of OCD. It measures three domains (a) pivotal sense of personal responsibility/overestimation of threat; (b) intolerance for uncertainty/perfectionism; and (c) importance of thoughts/control of thoughts. The OBQ-44 and its subscales relate significantly to symptoms of OCD, although the relevance of its specific subscales to OCD continues to be examined (Moulding et al., 2011; Shams, Esmaili, Karamghadiri, Ebrahimkhani, Yousefi, & McKay, 2014; Shams & Milosevic, in press; Tolin, Worhunsky, & Maltby, 2006; Wu & Carter, 2008). Each item is rated on a 7-point Likert-type scale, from "disagree very much" to "agree very much". In the current study, the mean of responses was utilised to improve interpretability of coefficients. As described in Radomsky et al. (2014), mean replacement was used for missing data from this questionnaire by site.[2] Of note, eight individuals (1.55%) in the current sample also failed to complete the overall OBQ; therefore, to retain sample size for the final mediation analysis, these were replaced by the mean OBQ score; 4 of these were from the Makeni site while all other sites had ≤ 1 missing case.

2.2. Participants

The participants included in this study were 683 volunteers from the 15 sites located in 13 countries, as detailed in the first paper in this series (Radomsky et al., 2014); people who reported mental health problems and people who were not of the nationality of the country in which testing took place had been removed from the dataset. Of these, 639 participants (93.5%) selected at least one intrusive thought, and so completed the second part of the interview. Furthermore, individuals who selected an "Other"-type intrusion as their most distressing were not included in this study as these thoughts vary widely in their relevance to OCD symptoms (e.g., song looping in head, unpleasant memories of past, thoughts about failure), leaving 516 participants in the analysis (see Radomsky et al., 2014 and Clark et al., 2014, for more discussion of the "other" thought category). This sample comprised 175 males (M=24.2, SD=5.66) and 341 females (M age=21.6, SD=3.96).

2.3. Procedure

For a detailed description of the procedure, see Radomsky et al. (2014). In brief, after volunteering for the study, participants gave informed consent and completed the IITIS, along with the OBQ, and a number of questionnaire measures discussed elsewhere (see Clark et al., 2014). Study procedures were the same across sites.

3. Results

3.1. Data reduction

Data were analysed using R 2.15.2 and HLM 7. For the appraisal dimensions, levels of missing data was ≤ 3 observations, so these were replaced by the overall mean. Prior to correlational analyses, appraisals and control strategies were analysed for their dimensional structure, using the "psych" package in *R* (Revelle, 2012), with principal axis factoring and varimax rotation. Examination of the number of dimensions for the control strategies, with the exclusion of the "do nothing" strategy, which is not conceptually consistent with the other approaches, suggested between two potential factors (Horn's parallel analysis of resampled data), two or three factors (Scree Plot), to five factors (Very Simple Structure criterion). Examining the three factor solution resulted in one factor without any highly loading items (highest.48), while the five factor solution resulted in single item scales, suggesting the two factor solution was most appropriate.

When examining the final solution, items in the first factor included distraction with activity, replacing the thought with a pleasant one, tell myself "stop", think thoughts to cancel out the intrusion, and avoiding triggers. Items in the second factor were to seek reassurance from others, reassure myself, engage in a compulsive ritual, and reason with myself. Most items had a clear primary loading and separation to the secondary factor, with the exception of reassure myself (primary.48; secondary.44) and engage in a compulsive ritual (primary 0.34; secondary −0.01). However, as these items were deemed to be conceptually related to the other items in the factor, and to maximise factor length, they were retained (for details of factor loadings, please contact the primary author). The factor items were generally consistent with those labelled by Lee and Kwon (2003) as avoidant strategies (factor 1; five items including both neutral and negative avoidant items) and confrontational strategies aimed at putting things "just right" (factor 2; four items), so these factor labels were chosen. The items are also mostly consistent with Langlois, Freeston, and Ladouceur's (2000) analysis of strategies (there labelled escape/avoidance and problem-focussed strategies). Alpha was.74 for avoidant and.52 for confrontational strategies. While alpha was low for the second factor, given the small number of items this was deemed to reflect the diversity of confrontational strategies spanned rather than measurement error per se. The scales were averaged, with a final interscale correlation of 0.45.

For the appraisal items, the criteria for number of dimensions suggested between two and six factors may be present. However, the solutions with large numbers of factors were deemed to be overextracting due to the presence of single item scales. Furthermore, even the 2-factor solution included one factor with only two

[1] For copies of the IITIS, please contact project chair Prof. David Clark (email: clark@unb.ca) or co-chair Prof. Adam Radomsky (email: adam.radomsky@concordia.ca).

[2] With respect to the sample of 516, there were 21 individuals who were missing at least one item from the 44-items of the OBQ: 5 in Makeni; 4 Israel; 3 Binghamton; 3 Turkey; 2 Valencia; 2 Thessaloniki; 1 Melbourne; 1 Buenos Aires.

Table 1
Correlations between though aspects and appraisals and control strategies, collapsed across sites.

	Thought characteristics			OBQ	Appraisal	Control Strategies	
	Distress	Importance	Persistence			Confront	Avoid
Thought characteristics							
Frequency	0.37	0.17	0.28	0.10	0.17	0.25	0.07
Distress		0.42	0.50	0.23	0.51	0.39	0.35
Importance			0.50	0.19	0.46	0.35	0.38
Persistence				0.22	0.49	0.33	0.28
OBQ					0.33	0.27	0.32
Appraisal						0.50	0.50
Confront							0.45

Note: $N=516$. All correlations significant at $p<0.001$; except avoidant control and thought frequency, $p=0.14$; OBQ and thought frequency, $p=0.02$. OBQ=Obsessive Beliefs Questionnaire.

Table 2
Coefficients for final four models predicting thought aspects from appraisals and control strategies with site as random factor.

	Estimate	SE	*t*	*p*
Predicting frequency				
Intercept	2.104	0.170	12.41	< 0.001
Appraisal	0.136	0.634	2.13	0.034
Confrontational	0.183	0.057	3.18	0.002
Thought-content	0.422	0.116	3.64	< 0.001
Predicting distress				
Intercept	0.625	0.155	4.03	< 0.001
Appraisal	0.574	0.061	9.33	< 0.001
Confrontational	0.239	0.055	4.33	< 0.001
Predicting importance				
Intercept	1.207	0.175	6.88	< 0.001
Appraisal	0.435	0.072	6.03	< 0.001
Confrontational	0.160	0.062	2.57	0.010
Avoidant	0.207	0.058	3.60	< 0.001
Predicting persistence				
Intercept	0.541	0.156	3.48	< 0.001
Appraisal	0.643	0.067	9.58	< 0.001
Confrontational	0.155	0.061	2.56	0.011

$N=516$. Content=type of thought content with repugnant coded as 0, non-repugnant as 1.

items, where one was highly loading (0.81; perfectionism) and the second not so highly (0.46; ego-dystonicity). Therefore, the single scale solution was deemed to be most interpretable, with factor loadings from 0.33 (responsibility) to 0.68 (intolerance of anxiety/distress). The appraisals were summed, with a correlation of scores with factors of.89, and an alpha was 0.75. Such a unifactorial solution for the appraisal scale is consistent with the OCCWG's (2005) factor analysis of their appraisal measure – the Interpretation of Intrusions Inventory. Initial correlations between aspects of the thoughts and the appraisal and control scales are indicated in Table 1.

3.2. Prediction of intrusive thought frequency, distress, importance, and difficulty dismissing

As a first step towards examining for inter-site differences in relationships between variables, linear regression models predicting each dependent variable were built for the overall dataset, with step one including appraisals and control dimensions, step two including thought content (coded as 0=repugnant, 1=non-repugnant), and step three including interaction terms between thought content and the other three predictors (see Table 2). For all four variables (frequency, distress, importance, & persistence), the first step was significant, $Fs(3,512)>12.36$, $ps<0.001$, with all predictors significant ($ps<0.019$) excepting avoidant strategies for frequency ($p=0.257$) and persistence ($p=0.737$). In step 2, thought content only added to prediction of thought frequency, $F(1,511)=13.62$, $p<0.001$ (all other $Fs<0.38$, $ps>0.05$), and step 3 did not generally add to prediction.[3] The final models were all significant, with 9%, 29%, 23% and 24% of variance predicted in frequency, distress, importance and persistence respectively. Regression coefficients for this model are available on request from the contact author.

3.3. Cross-cultural comparisons

Following construction of the overall regression models, we wished to examine how these relationships were altered when country was also considered within the analysis. As the data were clustered within sites across different countries, modelling the hierarchical nature of the data is ideal as ignoring the hierarchical structure can falsely inflate type I error probabilities. Therefore, we constructed hierarchical linear models in R using the "nlme" package (Pinheiro, Bates, DebRoy, Sarkar, & R Development Core Team, 2013). Predictors were only considered if they were significant in the overall linear model constructed in Section 3.2. Level 1 considered participant effects, and Level 2 considered site effects. As the 0 point was considered meaningful, representing no intrusions, no distress, and so forth, the data was not centred (Tabachnick & Fidell, 2007).

The first model examined the frequency of intrusive thoughts, as predicted by appraisals, confrontational strategies and thought content. Initial analyses using a null model found an intraclass correlation (ICC) of 4.02%. While this was relatively low, Barcikowski (1981) suggests that with a reasonable sample size even small ICC values can lead to inflation of alpha levels. Changes in AIC and log likelihood difference tests suggests that enabling random intercepts across sites significantly improved the model over a fixed intercept model (AIC=1637.3 vs. 1634.0; $\chi^2(1)=5.29$, $p=0.022$), indicating that a multilevel model is appropriate; and that adding the three predictors (appraisal, confrontational control strategies, and thought content) with fixed coefficients improved

[3] Significant interaction effects were only observed for the importance of removing the thought (importance, $F(3,507)=3.64$, $p=0.008$; Frequency, $F(3,507)=1.72$, $p=0.16$; distress, $F(3,507)=1.85$, $p=0.14$; dismiss, $F(3,507)=0.74$, $p=0.52$). However, examination of the centred interaction effects indicated that the significance was due to a mutual suppression effect between two pairs of interaction variables (content by appraisal and content by avoidant strategies). Given the lack of main effects combined with the instability of suppression effects (Tabachnick & Fidell, 2007), particularly for two interaction outcomes, it was decided to not further examine the suppression effect that existed for the single outcome dimension, but to retain the thought content type in the thought-frequency analysis. Further information regarding these analyses are available from the contact author upon request.

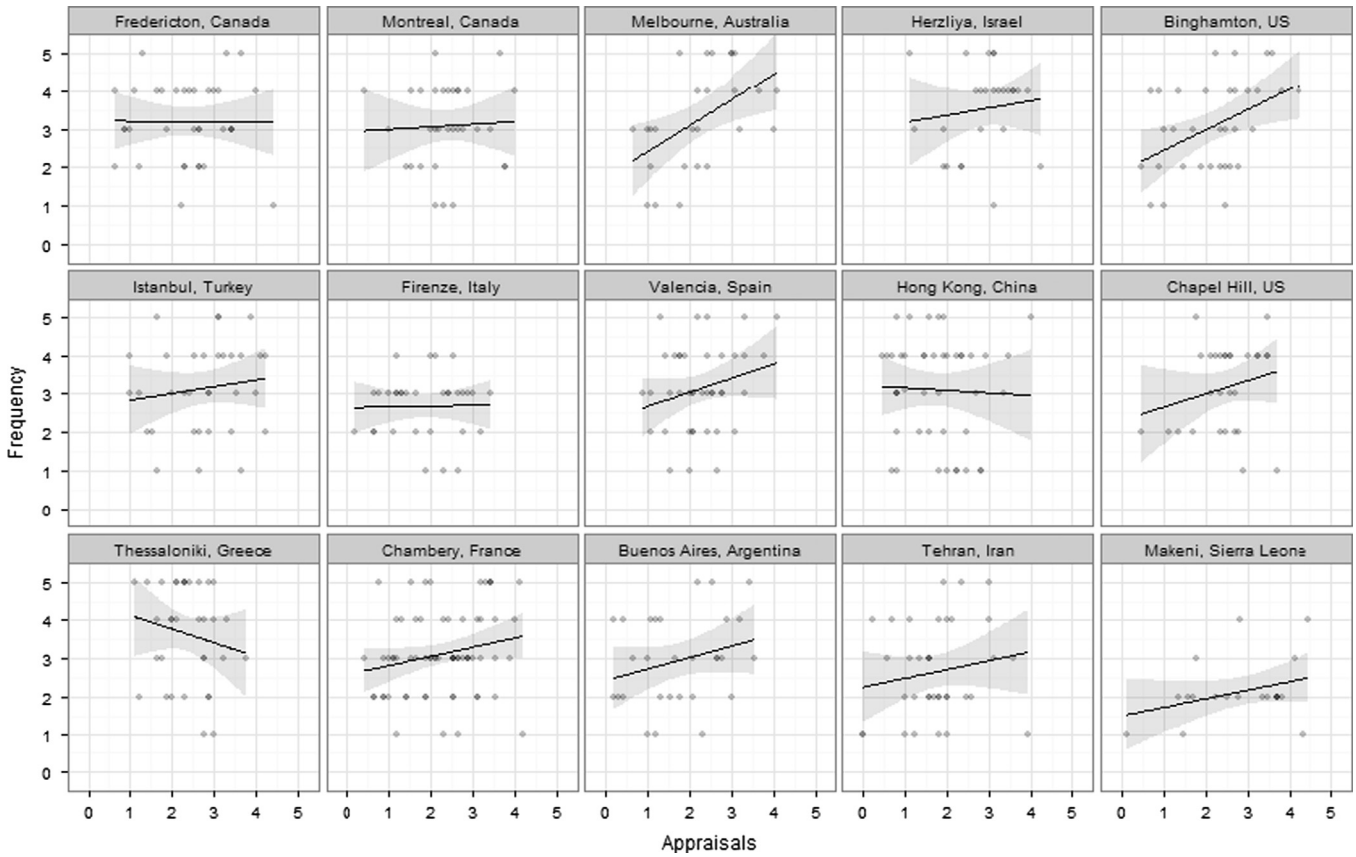

Fig. 1. Frequency of thoughts against appraisal strategy endorsement, with linear fit lines by site and 95% confidence intervals. Fit lines as interpretation guide only (random slopes not included in model). Darker circles indicate overplotting of datapoints.

this model further (AIC=1595.1; $\chi^2(3)=44.92$, $p<0.0001$). However, modelling these predictors with random coefficients did not significantly improve the model further (AIC=1606.6; $\chi^2(9)=6.54$, $p=0.69$). Therefore, the model with fixed predictor coefficients and a random intercept was selected as the final model (see Table 2 for coefficients). The standard deviation of the intercept at the site level in the model was 0.18 [0.07,0.46].

This same procedure was used to examine models predicting distress, importance of dismissing the thought, and difficulty dismissing the thought. For these analyses, the ICC was 9.18%, 10.56% and 2.94% respectively. When predicting distress, there was again significant variance in the intercept due to site (AIC=1769.0 vs. 1744.8, $\chi^2(1)=26.19$, $p<0.0001$); and the predictors added significantly to the model (AIC=1586.3, $\chi^2(2)=162.54$, $p<0.0001$) with fixed coefficients, whereas adding all predictors with random coefficients did not further improve the model (AIC=1591.5, $\chi^2(5)=4.80$, $p=0.44$). The SD of the intercept was 0.27 [0.16,0.47]. Predicting importance led to a similar pattern, with significant variance in the intercept (AIC=1835.0 vs. 1802.2, $\chi^2(1)=34.78$, $p<0.0001$), significant improvement with predictors with fixed coefficients (AIC=1677.8, $\chi^2(3)=130.42$, $p<0.0001$), but with no significant additional improvement with random coefficients (AIC=1689.1, $\chi^2(9)=6.68$, $p=0.67$). In the final model, the intercept's SD was 0.33 [0.20, 0.55].

Finally, this pattern was also found when predicting difficulty dismissing the thought, with significant variance in intercept (AIC=1822.7 vs. 1819.3, $\chi^2(1)=5.41$, $p=0.020$), significant improvement with the predictors added with fixed coefficients (AIC=1680.5, $\chi^2(2)=142.8$, $p<0.0001$), but with no significant additional improvement with random variation in the appraisal predictor coefficient (AIC=1687.7, $\chi^2(5)=2.88$, $p=0.72$). The SD of the intercept in the final model was 0.17 [0.07, 0.39]. Therefore, for all aspects of thoughts, there were overall differences in the intercepts across sites, representing overall differences in frequency (consistent with Radomsky et al., 2014), but not significant differences in the relationship between appraisals and thought aspects. Final regression weights are shown in Table 2.

To assess robustness of the analyses at group level, the significance of the 14 individual predictors was examined with sequential removal of testing sites. All predictors remained significant when sequentially removing each site from the analysis, with the notable exception that the prediction of frequency by appraisal became non-significant when removing a number of the sites – namely, Melbourne; Binghamton; Valencia; Chambery; Buenos Aires; and Tehran. As such, the relationships should generally be considered robust – with the thought frequency-appraisal dimension being the single notable exception.[4]

For illustration of the potential variability in relationships, the four thought dimensions plotted by the most important predictor in cognitive models (appraisals) are indicated by site in bivariate scatterplots in Figs. 1–4, along with illustrative lines of best fit allowed to vary across sites; note that as slopes were modelled as fixed effects these regression lines are only included as an aid to interpretation.

[4] Note that outliers were examined for the four HLM analyses. Cook's distance was recorded for the final models; with individual participants with values over 4/*N* for the respective analyses excluded (< 5% for each analysis; final *n* ranged from 493 to 497). In all cases, re-running analyses with these participants removed as a block did not alter significance levels; with the single minor exception that the intercept for ease of dismissal fell short of significance (0.24; final $t=1.61$). As such, the analyses were taken to be robust to individual level data.

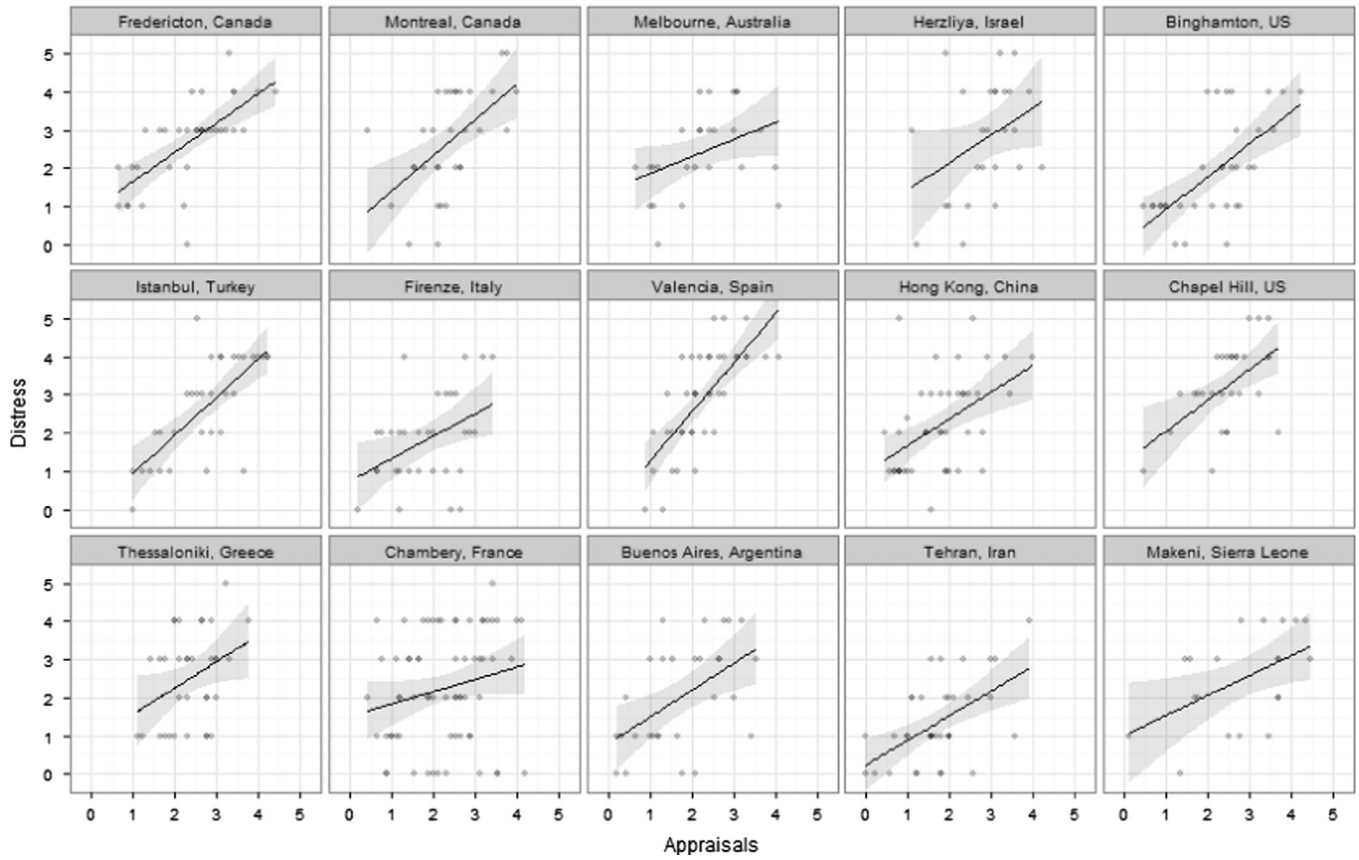

Fig. 2. Distress related to thoughts against appraisals endorsement, with linear fit lines and 95% confidence intervals. Fit lines as interpretation guide only (random slopes not included in model). Darker circles indicate overplotting of datapoints.

3.4. Do appraisals and control strategies mediate the relationship between obsessive beliefs and intrusive thought frequency, distress, importance to dismiss and difficulty in dismissing?

The final analysis of interest was to test whether appraisal and control strategies mediate the relation between beliefs and aspects of the most distressing intrusion (e.g., frequency, difficulty dismissing). To investigate mediation effects within a hierarchical model (i.e., the 1-1-1 mediation model), standard approaches for non-hierarchical data such as the three-step analysis by Baron and Kenny (1986) have been criticized, as they confound between-group and within-group variance (Zhang, Zyphur, & Preacher, 2009). As such, we utilised the CWC(M) approach of Zhang et al., whereby predictors are centred within context (i.e., at the site level), and the means are reintroduced as a level 2 predictor.

This analysis performed using the constructed models from Section 3.2, using HLM 7 (see Table 3), with the exception that thought-type was omitted from the frequency model due to its being a binary variable; prediction methods for dichotomous variables (when considered as a DV) entail alteration of response scales due to logistic analyses, with a consequent lack of uniformity in prediction. Follow-up Sobel tests were performed if the requirements of Steps 1 (OBQ predicting the outcome) and 2 (OBQ predicting the mediators) were met. At no stage did the OBQ at group level predict the outcome ($p > 0.05$), so only individual level mediation was possible (group-level statistics available on request). In all four analyses, the OBQ significantly predicted the outcome and all potential mediators, so steps 1 and 2 were met.

For thought frequency, at step 3, only the confrontational strategies mediator was significant, with the Sobel test at the individual level confirming partial mediation ($z=3.28$, se$=0.022$, $p=0.001$), with some direct effect remaining between the OBQ and frequency. For distress, the OBQ significantly predicted at step 3, but the Sobel test indicated there was partial mediation at the individual level through both appraisals ($z=5.62$, se$=0.034$, $p<0.001$) and confrontational strategies ($z=3.28$, se$=0.021$, $p<0.001$). For importance, the OBQ was fully mediated via appraisals ($z=4.53$, se$=0.034$, $p<0.001$), confrontational strategies ($z=2.20$, se$=0.020$, $p=0.03$), and avoidant strategies ($z=3.00$, se$=0.02$, $p=0.002$). For difficulty dismissing, the OBQ was partially mediated via appraisals ($z=5.87$, se$=0.040$, $p<0.001$) and confrontational strategies ($z=2.29$, se$=0.20$, $p=0.02$).

4. Discussion

The current study examined intrusive thoughts, and the appraisal and control strategies in response to these thoughts in a sample of over 516 participants from 15 sites spanning 13 countries around the world. This data is not only unique in its large sample size and scope of participants, but also refines methods used in prior studies through use of a semi-structured interview, thus increasing confidence in the validity of the data compared to self-report measures that were predominantly used in previous studies (with notable exceptions including Rachman & de Silva, 1978; Ladouceur et al., 2000). Overall, findings were consistent with cognitive models of OCD but, contrary to hypotheses, revealed little in terms of site differences. First, frequency, distress, importance and persistence of the most distressing intrusion were all significantly predicted by appraisals and control strategies, albeit with less variance predicted for thought frequency than for the other variables. While modelling overall site differences improved the models, there were no differences in terms of influencing the strength of relationships between variables. Secondly, thought content only related to the frequency of thoughts but no other variable, and did not interact with other variables in influencing

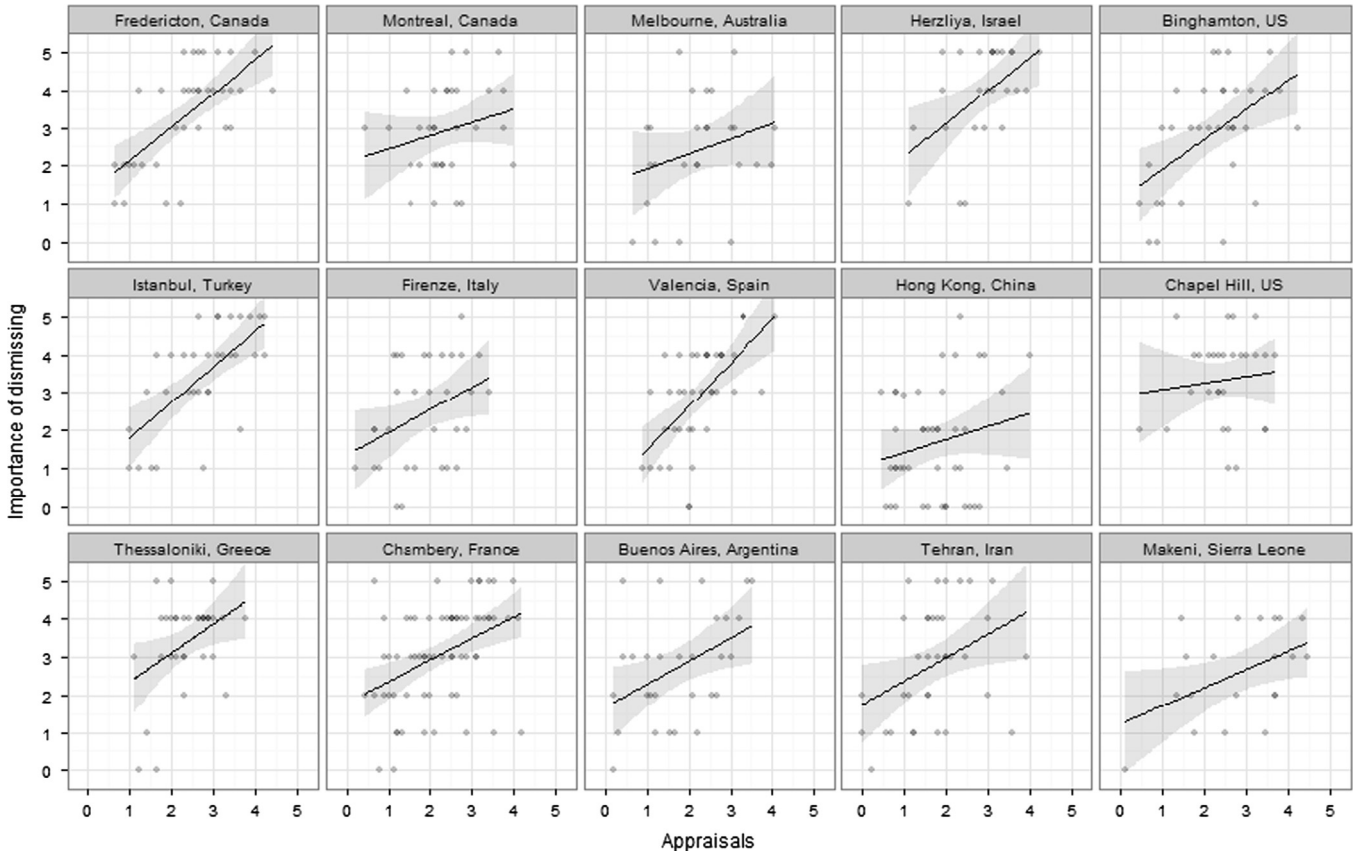

Fig. 3. Importance of removing thoughts against appraisal endorsement, with linear fit lines and 95% confidence intervals. Fit lines as interpretation guide only (random slopes not included in model). Darker circles indicate overplotting of datapoints.

relationships. Finally, evidence was found for mediation of the relationship of beliefs to the most distressing intrusion frequency, distress, and so forth, although some direct relationships remained.

Considering the findings as one sample across sites, several interesting results emerged. First, reactions to intrusions including the amount of distress associated with them, the perceived importance of getting them out of one's mind and their persistence or difficulty dismissing them were moderately-to-strongly correlated with both appraisal and control strategies. These findings regarding reactions to intrusions are consistent with predictions from cognitive models that interpretations of importance and maladaptive control strategies exacerbate the salience of the thoughts (Clark, 2004; Rachman, 1993; Salkovskis, 1985). We also showed that experiencing intrusive thoughts more frequently was related to stronger appraisals (e.g., beliefs that the thought was meaningful, that the individual was responsible for the thought, etc.) and greater use of confrontational control strategies (e.g., seeking reassurance from others, engaging in a ritual). However, it should be noted that the relationship between frequency and appraisals in particular was not strong, only just reaching significance in the multivariate analysis; and this fact was reflected in the effect becoming non-significant when some of the sites were sequentially removed from analysis. As such, it seems that how commonly the thoughts are experienced only weakly relates to appraisals, but is much more impacted by what is habitually done to remove the thoughts.

The avoidant control strategy dimension was not found to be significantly associated with the frequency of intrusions. The lack of significant relationship between the frequency of intrusions and control strategies is similar to the bulk of prior data (Purdon & Clark, 1994a, 1994b). However, these findings can be seen as at odds with other studies. For example, in the current study avoidant control strategies were not associated with the frequency of intrusions, which seems inconsistent with data showing that attempts to suppress thoughts paradoxically increases them (e.g., Salkovskis & Campbell, 1994; Trinder & Salkovskis, 1994) or is related to decreased ease of dismissal (see Clark, 2004; Freeston et al., 1991). When reviewing the literature, Clark also noted that the literature between thought suppression effects and thought frequency is not consistent; however, avoidant strategies also did not relate in this study with Clark's recommended alternative – the ease of thought dismissal – when considered alongside other variables in our regression analysis. One possible explanation for the finding is that the items assessing avoidant control strategies in the current measure may have been more similar to attempts to "move forward" in contrast to efforts to actively eliminate the thought. It is also possible that given the unselected nature of the sample, there may have been floor effects regarding the frequency of intrusions, thereby suppressing correlations with other constructs, although the existence of correlations with other measures would argue against this. Finally, it is possible that the magnitude of the relation between control strategies and the frequency of having intrusive thoughts may vary according to OCD severity. While future studies can further examine the relation between avoidant control strategies and the frequency of intrusions, overall the current results further support links between intrusions and appraisals and control strategies. It should be noted that, while based on the existing literature (e.g., Freeston et al., 1991; Freeston & Ladouceur, 1993; Purdon & Clark, 1993, 1994a, 1994b) and having face-validity, the measure of appraisals and control strategies has not been validated, and although efforts were undertaken to create a reliable measure through factor-analysis, the reliability of the confrontational strategies subscale is quite low. As such, further effort is needed to ensure that the measures capture what they purport to, to improve confidence in these findings.

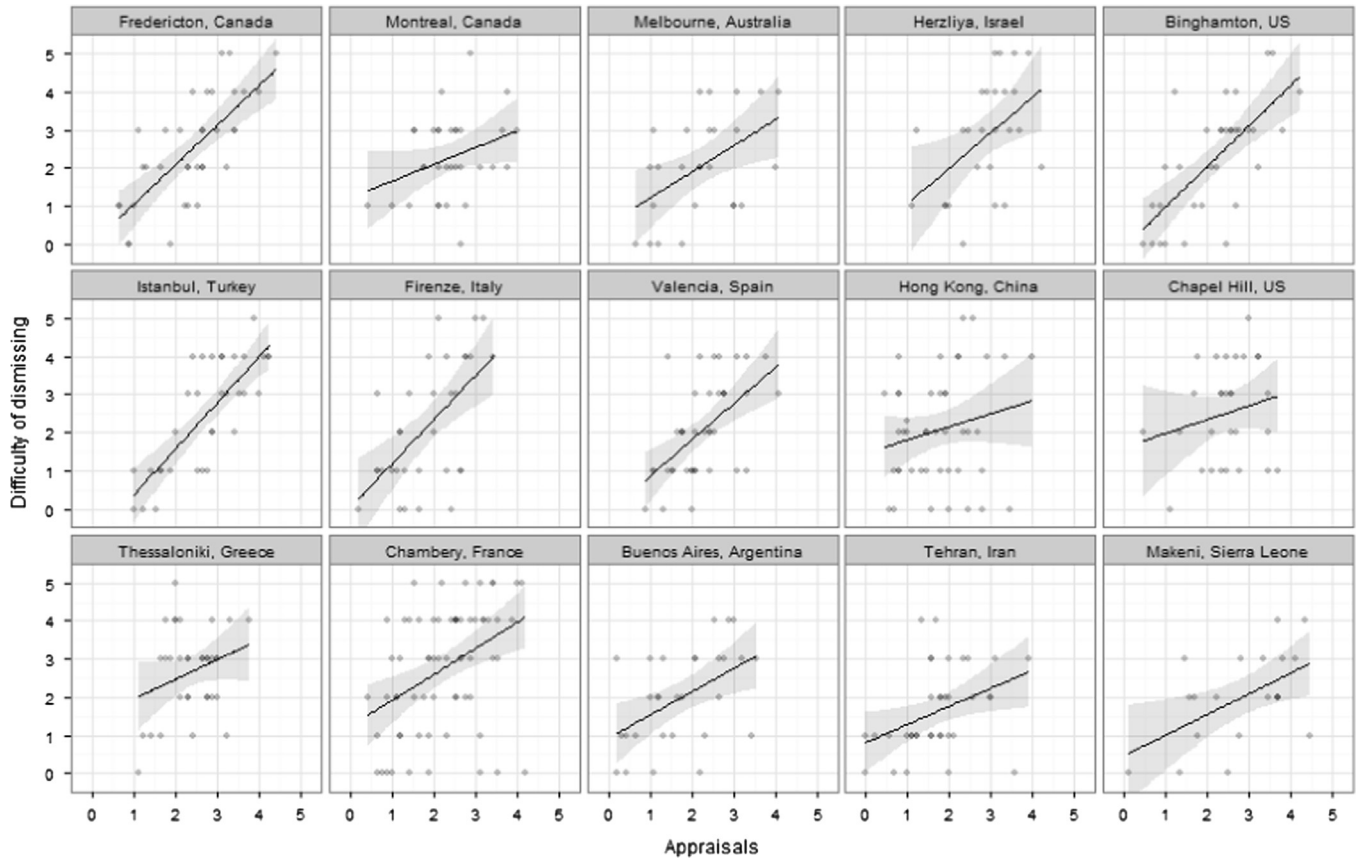

Fig. 4. Persistence of thoughts against appraisal endorsement, with linear fit lines and 95% confidence intervals. Fit lines as interpretation guide only (random slopes not included in model). Darker circles indicate overplotting of datapoints.

Table 3
Mediation Models using CWC(M) approach with individual-level effects shown.

Dependent Variable (DV)	Step 1 – OBQ to DV	Step 2 – OBQ to Mediator Variables			Step 3 – Dependent and mediator variables to DV			
		Appraisal	Confrontational	Avoidant	OBQ	Appraisal	Confrontational	Avoidant
Frequency	0.25 (0.074)***	0.38 (0.048)***	0.30 (0.056)***	–	0.16 (0.067)*	0.04 (0.065)	0.23 (0.056)***	–
Distress	0.47 (0.069)***	0.38 (0.048)***	0.30 (0.056)***	–	0.20 (0.066)**	0.51 (0.064)***	0.23 (0.055)***	–
Importance	0.35 (0.088)***	0.38 (0.048)***	0.30 (0.056)***	0.38 (0.059)***	0.08 (0.072)	0.41 (0.074)***	0.15 (0.062)*	0.20 (0.059)***
Persistence	0.45 (0.076)***	0.38 (0.048)***	0.30 (0.056)***	–	0.18 (0.083)*	0.62 (0.071)***	0.15 (0.059)*	–

* $p < 0.05$;
** $p < 0.01$;
*** $p < 0.001$.

Thought content was found to have only a minor relationship with rating dimensions for the individual's most distressing intrusive thought. Specifically, non-repugnant obsessions were more frequent than repugnant obsessions, consistent with Belloch et al. (2007). However, repugnant vs. non-repugnant distressing thoughts were not found to differ significantly on other dimensions (distress, importance, and persistence) when examined over-and-above the influence of appraisals and control strategies. Similar results were recently reported in in non-clinical and clinical samples (García-Soriano & Belloch, 2013), although this contrasts with previous researchers who have suggested that repugnant obsessions should be more unpleasant while non-repugnant obsessions should be more difficult to dismiss (e.g., Lee & Kwon, 2003). It is unclear the reason as to this discrepancy, although it may be that through selecting their most distressing obsession in the first instance, differences between thought-types are reduced (i.e., as opposed to rating how unpleasant *typical* repugnant vs. non-repugnant thought types might be; cf. Lee & Kwon, 2003, study 3). It is also possible that the different thought types meant that respondents were interpreting the questions differently. That is, for repugnant obsessions, people perhaps are generally more concerned with the content of the thought itself, whereas in the case of non-repugnant obsessions, they tend to more concerned with what it refers to in the world. In both cases, respondents may be rating their distress similarly, but answering different questions: namely "having this thought really bothers me" vs. "the state of affairs this thought refers to in the external world really bothers me".[5] Future research may wish to examine these issues. However, importantly, there were no major interaction effects detected between thought content and appraisal and control dimensions, with the exception of a suppression effect of unclear relevance, despite the large sample size suggesting that moderation effects should be detectable. This suggests that, as

[5] We thank an anonymous reviewer for this suggestion.

with the country differences discussed below, cognitive models are equally relevant to repugnant and non-repugnant thoughts; albeit that different therapeutic strategies may be important for the different thought types (e.g., see Purdon, 2004; Rachman, 2007).

Considering the cross-cultural findings, there was very little evidence of differences in intrusive thoughts in their relationship with appraisal and control strategies. Indeed, when creating hierarchical linear models of the effects, the models were only improved when modelling with random intercepts, but leaving the slopes as fixed. The finding that intercepts varied across sites indicates that there were overall differences in thought frequency, difficulty of dismissal, distress and ease of dismissal across sites. While there are some differences in analytic strategy, these findings are generally consistent with the other papers in this series that have reported differences between countries in aspects such as overall endorsement of intrusive thoughts (for detail regarding specific differences between countries, see Clark et al., 2014; Radomsky et al., 2014). More importantly, the finding that the model was not improved when including as random variables the relationship between the thought appraisals and control strategies, on the one hand, and thought frequency, ease and importance of dismissal, and resultant distress, on the other, indicates that the associations did not seem to vary to a great degree despite the variety of countries tested in this study. Note that caution should be used when interpreting a null finding; it could be, for instance, that meaningful differences in the relationships become apparent when more sites are tested (e.g., >25), with the concomitant increase in power. The measurement and inclusion of suitable cultural variables at the second level may also result in the observation of systematic variations in these relationships. A final caveat is that our findings are based on cross-sectional, observational data, so this does not preclude other variables explaining this relationship, such as general affect-related variables (see for e.g., O'Connor, Aardema & Pélissier, 2005). Nonetheless, on the strength of the current evidence, cognitive variables such as appraisals did not seem to vary in their relationship with distress regardless of the country in which they were examined; or at the least, such variation was minor and thus did not add to prediction (particularly with respect to distress, importance and ease of dismissal). This finding suggests that the cognitive model has utility trans-nationally, and adds credence to the use of CBT models derived predominantly in English-speaking Western countries in countries utilising other languages (e.g., Spain, France, etc.) and in countries that can be considered less-"Westernized" (e.g., Iran, Sierra Leone).

There are many areas for further examination of intrusions and the reactions to them with regards to cultural differences. One area of inquiry would be to further examine what leads to intrusions and whether the mechanisms are the same across cultures. The current findings show many similarities in the experience of intrusions but do not address their origins. Indeed, multiple pathways may lead to the same outcome (See Cicchetti & Rogosch, 1996, for a discussion of equifinality). In the context of the current study, different combinations of genetic and/or environmental factors may lead to intrusive thoughts and beliefs regarding them (e.g., see Alonso et al., 2013). For example, Salkovskis et al. (1999) proposed that specific childhood experiences (e.g., exposure to rigid rules, experiences with overprotective parents, etc.) contribute to the development of inflated responsibility beliefs. This model was developed within a Western framework and may be less relevant for non-western cultures: experiences may manifest differently in other cultures or different types of experiences may be more or less relevant. Other researchers have posited the utility of perceptions of the self as dangerous or careless may lead to the experience of intrusions or underlie appraisals of intrusions as meaningful (e.g., Aardema et al., 2013; Bhar & Kyrios, 2007; Doron, Kyrios, Moulding, Nedeljkovic, & Bhar, 2007; Doron, Moulding, Kyrios, & Nedeljkovic, 2008; Ferrier & Brewin, 2005; Lipton, Brewin, Linke, & Halperin, 2010); again the cross-cultural utility of such theorizing deserves attention.

The mediational results of this study demonstrated that general beliefs mainly appear to influence intrusive thoughts through appraisals and control strategies, although some direct relationships remained. In particular, the OBQ's influence was statistically mediated via a combination of appraisals and control strategies for distress, importance and ease of dismissal, but only through confrontational strategies for frequency. This latter somewhat puzzling finding likely reflects the lower relationship generally between appraisals and thought frequency in this study. However, it perhaps suggests that the importance of the influence of general beliefs is not just on the appraisals made regarding specific thoughts, but also could be due to their influence on the general control strategies used regardless of specific maladaptive interpretations of thoughts. That is, for instance, a person who generally believes that "thoughts can and should be controlled" may have a general trait-like tendency towards exercising thought control strategies that then influence thought-frequency, regardless of the significance attributed to any individual thought. As such, this finding provides a further rationale for the use of direct behavioural techniques in exposure work. It is unclear whether the partial mediation reflects the operation of other intervening mechanisms not studied here, or simply reflects variation in measurement properties (e.g., the appraisal measure was shorter in length yet wider in its measured construct than the OBQ; and the appraisals were completed verbally in the interview while the OBQ was completed in a written form).

A future area for exploration will be regarding the stability of appraisal and control strategies across time and developmental stages. Evidence of particular beliefs being related to OCD or OCD-symptoms in adults has been repeatedly demonstrated (e.g., OCCWG, 2005; Moulding et al., 2011) and there is accumulating evidence that beliefs and attributions may also play a role in OCD in youth (e.g., Barrett & Healy, 2003). As noted above, the mediational results of this study suggest that beliefs mainly, but not exclusively, appear to influence intrusive thoughts via appraisals and control strategies. In disorders such as depression, negative explanatory style and cognitive biases persist over long periods of time and during symptom remission (Burns & Seligman, 1989). Recent work has shown that OC symptom dimensions are relatively stable over several years in youth with OCD symptoms (Fullana et al., 2009) and adults diagnosed with OCD (Mataix-Cols et al., 2002; Rufer, Grothusen, Maß, Peter, & Hand 2005). Building from data showing that children who endorse experiencing obsessions or compulsions as youth are at elevated risk for meeting diagnostic criteria in adulthood, it would be useful to examine whether the presence of particular appraisal or control strategies in addition to the symptoms would improve the prediction of which individuals are most likely to develop full-blown OCD. Further, even if appraisals and control strategies remain at relatively stable levels over time, developmental and environmental factors may lead to periods in which these reactions are more or less malleable, thereby suggesting when interventions may be most productive.

In conclusion, this study found that, while there were differences in overall rates of intrusive thoughts across sites, the relationship between thoughts, appraisals and control strategies did not vary. Furthermore, different content of thought also did not influence the relationships between frequency and distress, and appraisals and control strategies. Finally, beliefs seemed to mainly influence intrusive thoughts via appraisals and control strategies, although some direct effects remained. Taken together,

these findings add credence to the applicability of Western-derived models to non-Western cultures, and of the cognitive model to intrusive thoughts regardless of content. Despite our findings, many questions remain unanswered – but it is hoped that this paper adds to the interest of using non-Western samples to expand our knowledge of OCD, and to our confidence in applying knowledge that was largely derived in the West in non-Western settings.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.jocrd.2014.02.006.

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