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An analysis of matching cognitive-behavior therapy techniques to learning styles

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ABSTRACT

Background and objectives: To optimize the effectiveness of cognitive-behavior therapy (CBT) for each individual patient, it is important to discern whether different intervention techniques may be differentially effective. One factor influencing the differential effectiveness of CBT intervention techniques may be the patient's preferred learning style, and whether this is 'matched' to the intervention.
Method: The current study uses a retrospective analysis to examine whether the impact of two common CBT interventions (thought records and behavioral experiments) is greater when the intervention is either matched or mismatched to the individual's learning style.
Results: Results from this study give some indication that greater belief change is achieved when the intervention technique is matched to participants' learning style, than when intervention techniques are mismatched to learning style.
Limitations: Conclusions are limited by the retrospective nature of the analysis and the limited dose of the intervention in non-clinical participants.
Conclusions: Results suggest that further investigation of the impact of matching the patient's learning style to CBT intervention techniques is warranted, using clinical samples with higher dose interventions.

1. Introduction

While cognitive-behavior therapy (CBT) has demonstrated efficacy for a variety of disorders (Butler, Chapman, Forman, & Beck, 2006), there remains room for improvement – a significant proportion of patients do not benefit from CBT and the mean improvement among responders may only be 20–50% (Westbrook & Kirk, 2005). Furthermore, the limited resources in routine clinical practice (White, 2008) and high drop out rates early in therapy (e.g., Bados, Balaguer, & Saldana, 2007) mean that there is a need to optimize the effectiveness of CBT for each individual patient, at the earliest opportunity. Recent research suggests that a variety of different single-sessions interventions (e.g., solution focused, exposure, motivational interviewing, CBT) can lead to clinically and statistically significant improvements (e.g., Perkins, 2006) to the extent that more than one-third of patients do not require any further intervention, and are satisfied with the intervention (see Bloom, 2001; Zlomke & Davis III, 2008 for reviews).

As a route to increased therapy effectiveness, research has endeavored to match patients to particular kinds of therapy (Allen, Babor, Mattson, & Kadden, 2003; Giovazolias & Davis, 2005). Patient-treatment matching can be defined as a method of choosing between alternative treatment options based on particular patient characteristics that interact differentially with interventions to produce a more favorable outcome (Mattson et al., 1994). Patient-treatment matching has shown some promising results in matching patients' characteristics, such as personality traits, and coping style to different substance abuse treatments (e.g., Conrod et al., 2000; Karno & Longabaugh, 2007) and stress management interventions (e.g., Martelli, Auerbach, Alexander, & Mercuri, 1987). However, no research has looked at the impact of matching therapy technique to patients' learning style, a characteristic more commonly identified in educational environments.

In the last three decades, the proposition that students learn in different ways has emerged as a prominent pedagogical issue within the field of education (Hawk & Shah, 2007). The individual's 'learning style' is their preferred mode of receiving and processing information, such as a preference for theoretical or practical

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methods of learning. Matching teaching methods to students' (Ford & Chen, 2001; Nor-Azan, 2009), supervisors' (Wolfsfeld & Haj-Yahia, 2010) and medical patients' (Arndt & Underwood, 1990) learning styles has been shown to maximize learning.

While there are a number of conceptualizations of learning styles one of the most influential has been Kolb's (1984) theory of experiential learning and conceptualization of four modes of the learning process. Rainey and Kolb (1995) describe the four different learning styles, two of which are directly relevant to the data we report here. 'Abstract Conceptualization' indicates an analytical approach to learning that relies heavily on logical thinking and rational evaluation, with less benefit from 'discovery' learning approaches such as exercises and role-plays. In contrast 'Active Experimentation' indicates an active, 'doing' orientation to learning that relies heavily on experimentation, with more learning occurring when the recipient engages in relevant tasks.

There are clear parallels with the broader fields of learning and education because CBT can be conceptualized as a process in which the patient learns (i.e., discovers new information in relation to existing beliefs or learns techniques to change beliefs or manage emotions) and the clinician teaches (Lightburn & Black, 2001) and educational principles are consistent with the overall didactic goal of CBT (Riess, 2002). Hence, we set out to investigate the effects of matching patients' learning styles with interventions in CBT. The matching hypothesis in psychotherapy research suggests that patients benefit more from therapeutic approaches and techniques that are similar to their specific cognitive or attitudinal styles (Babor, 2008). This implies that outcomes will be better when the intervention utilizes methods consistent with a patient's preferred learning style, because that is their natural, and therefore most efficient, way of processing information. If corrective information is encountered using the preferred mode, then processing load is reduced, with corresponding facilitation of acquisition and consolidation of the relevant information (Nor-Azan, 2009).

Thus we hypothesized that patients may achieve more change in targeted beliefs and associated behaviors and symptoms when CBT interventions were matched to their preferred learning style, than when they were not matched. The current study set out to test this hypothesis using retrospective analysis of the data reported by McManus, Van Doorn, and Yiend (2011). We examined whether the impact of two common CBT interventions, behavioral experiments or thought records, was greater when participant's learning style was matched (i.e., favored active experimentation or abstract conceptualization, respectively) than when it was mismatched.

2. Method

The current paper reports on data collected in a previously reported study comparing the relative efficacy of single-session behavioral experiment (BE) and thought record (TR) interventions in effecting belief and symptom change in a non-clinical sample.

2.1. Thought record (TR) intervention

The TR intervention involved the experimenter guiding the participant through the completion of a thought record (in the manner described by Greenberger & Padesky, 1995). Participants were asked to rate how much they believed the target belief ("not washing your hands after going to the toilet will make you ill") and to specify the details and timescale of any illness they might get from not washing their hands. Then the experimenter asked them to identify any evidence that supported their belief (e.g., parents' beliefs, information in the media, personal experiences) and any that did not support their belief (e.g., observations of the frequency of omissions or ineffectiveness of hand washing, personal experience of instances where people have not washed their hands but have not become ill). Participants were prompted to identify further evidence and reflect on their own experiences of not washing their hands after going to the toilet. After reviewing the evidence for and against the belief in detail participants formulated a 'balanced alternative belief' summarizing both the evidence for and against the target belief e.g., "Although I would feel dirty if I did not wash my hands after going to the toilet, I most likely would not get ill from it."

2.2. Behavioral experiment (BE) intervention

The BE intervention involved the experimenter guiding the participant through the completion of a BE record (in the manner described in Bennett-Levy et al., 2004). The BE intervention was identical to the TR intervention until the discussion of evidence for and against the target belief. At this point BE participants were asked to devise an experiment to test the validity of the target belief (e.g., to pass urine without washing their hands afterward to find out if they did become ill). As part of completing the behavioral experiment record sheet participants specified exactly what they would do during the experiment and how they would judge the outcome in relation to the target belief (e.g., how they would know if they became ill or not). Participants were then asked to carry out the experiment during the session. They then reviewed the implications of the experiment for their target belief. In line with the principles of BE's (Bennett-Levy et al., 2004) the experimenter encouraged participants to test their belief as fully as possible (e.g., if they believed that they were more likely to become ill from not washing their hands after going to the toilet if they then touched their face, they were encouraged to test this out).

For a more detailed description of recruitment, methodology of the interventions and treatment fidelity checks see McManus et al. (2011).

2.3. Participants

A non-clinical sample of student volunteers ($n = 59$) participated in the study, which tested the relative efficacy of single-session TR and BE interventions in effecting change in the belief 'not washing your hands after going to the toilet will make you ill'. Participants were excluded from the study if they were not fluent in English or if they had a current or past history of psychiatric disorder. Of the 91 participants in the McManus et al. (2011) study, 61 received an intervention (the remaining 30 were allocated to a control condition), and 59 of those had completed the measure of learning style so their data could be analyzed for this study.

2.4. Design

The study involved a mixed within/between participants' design where participants were divided retrospectively into two groups: (i) those who received a CBT technique that matched their learning style, and (ii) those who received a CBT technique mismatched to their learning style. Self-report outcome measures were administered at pre-intervention, post-intervention and at 1-week follow-up to assess the impact of the interventions.

2.5. Measures

2.5.1. Learning style

The Learning Style Inventory (LSI; Kolb & Kolb, 2005) is a commonly used measure to assess learning styles (Garner, 2000). The LSI consists of 12 sentences with a choice of four endings ranked 1–4 on how the ending fits with the preferred way of

learning (e.g., "I learn best from… personal relationships vs. observation vs. rational theories vs. a chance to try and practice"). Responses are scored on each of the four subscales: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). Previous research has demonstrated the LSI to have acceptable levels of validity and reliability (Kolb & Kolb, 2005; Willcoxson & Prosser, 1996), with a Cronbach alpha of 0.77 for the CE subscale, 0.81 for RO, 0.84 for AC and 0.80 for AE (Kolb & Kolb, 2005).

For the purpose of this study, only participants' scores on the active experimentation (AE) and abstract conceptualization (AC) subscales of the LSI (Kolb & Kolb, 2005) were used. The AE and AC subscale scores were used to categorize the participants into one of two learning styles according to whether they scored higher on the AE or AC subscale of the LSI. The TR was deemed most congruent with the AC learning style because this learning style relies on rational and logical thinking, reasoning and evaluating evidence, which is inherent in the process of completing a TR. Similarly, the BE was deemed to correspond with the AE learning style because the AE learning style involves learning by experimentation, by actively doing things and trying out new behaviors, which is crucial in BE. Participants were then categorized as 'matched' or 'mismatched' to their intervention with those scoring higher on AE being considered to be matched to the BE intervention and those scoring higher on the AC learning style being considered to be matched to the TR intervention.

2.5.2. Outcome measures

2.5.2.1. Beliefs, anxiety and avoidance ratings. In line with CBT's focus on belief change, it is suggested that CBT therapists evaluate the within session impact of interventions by assessing their impact on patients' belief ratings (Westbrook, Kennerley, & Kirk, 2007). Hence, the primary outcome measures for the current study were belief ratings, and ratings of associated situational anxiety and avoidance, made on visual analog scales. Higher scores were indicative of greater endorsement of the targeted beliefs or higher levels of anxiety or avoidance. The following measures were completed at pre- and post-intervention on the day of intervention, and at 1-week follow-up.

The targeted beliefs were "Not washing your hands after going to the toilet will make you ill" (Belief 1) and the related belief "Not washing your hands after using the toilet will make others ill" (Belief 2) on a 9-point Likert-scale from 1 = *don't believe this at all*, to 9 = *strongly believe this*. Related situational anxiety was measured by asking participants to rate how anxious they would feel if they had to go to the toilet without washing their hands afterward. Related situational avoidance behavior was measured by asking participants to rate how likely they would be to use the toilet without washing their hands in the next week, although it is possible that other factors, such as real environmental differences in access to hand washing facilities, might have influenced this rating. Both related anxiety and avoidance were measured on a 9-point Likert-scale from 1 = *not at all*, to 9 = *extremely*.

2.5.2.2. Symptom measures. To assess the broader impact of the interventions, standardized measures of obsessional and irrational beliefs, the Obsessional Beliefs Questionnaire-44 (OBQ-44; Obsessive Compulsive Cognitions Working Group, 2005) and Irrational Belief Inventory (IBI; Koopmans, Sanderman, Timmerman, & Emmelkamp, 1994) were completed pre-intervention and at follow-up. The OBQ-44 consists of 44 obsessional beliefs, which are rated on a 7-point Likert-scale, and has been shown to have adequate psychometric properties (Tolin, Brady, & Hannan, 2008). The IBI is a 50-item measure of general irrational beliefs that uses a 5-point Likert-scale and has been shown to have adequate psychometric properties (Bridges & Sanderman, 2002).

2.5.3. Confounding variables

In addition, measures of two possible confounding variables, namely therapeutic alliance (Scale To Assess Therapeutic Relationship, STAR; Mcguire-Snieckus, McCabe, Catty, Hansson, & Priebe, 2007) and credibility (Credibility Expectancy Questionnaire, CEQ; Borkovec & Nau, 1972) were included in the post-intervention measures. See McManus et al. (2011) for more detail.

3. Results

Preliminary analyses revealed that assumptions of normality were not violated hence parametric analyses are used throughout and all tests are two-tailed.

3.1. Intervention checks

The participants categorized as AE learning style ($n = 24$) scored significantly higher than those categorized as AC learning style ($n = 35$) on the AE subscale of the LSI (means [SDs] 36.67 [6.08] vs. 26.09 [0.96] $t(57) = -6.82$, $p < 0.001$) and significantly lower on the AC subscale (means [SDs] 26.38 [5.54] vs. 39.06 [0.80], $t(57) = 9.45$, $p < 0.001$). There was no difference in the proportion of participants receiving the TR or BE interventions in the 'matched' (14 BE: 17 TR) and 'mismatched' groups (17 BE: 11 TR) $\chi^2(57) = 1.43$, $p = 0.23$. Nor was there any difference in the alliance (STAR means = 36.00 [6.50] vs. 34.44 [8.10] $t = 0.80$ $p = 0.43$) and credibility of the interventions (CEQ means = 31.42 [7.41] vs. 30.89 [6.41] $t = 0.32$ $p = 0.75$) between the matched and mismatched group.

3.2. Participant characteristics

Twenty-eight participants (the "mismatched group") received an intervention mismatched to their learning style i.e., those that scored higher on the AC learning style but received the BE intervention and those that scored higher on the AE learning style but received the TR intervention. The remaining 31 participants (the "matched group") received an intervention matched to their learning style i.e., BE intervention and AE learning style or TR intervention and AC learning style.

To compare the matched and mismatched participants' characteristics χ^2 tests and independent t tests were used (see Table 1 for means and standard deviations). T-tests showed that the differences between the matched and mismatched groups' pre-intervention scores approached significance on the IBI, OBQ-44, and Belief 1 ($ps = 0.07$–0.15). Hence, analysis of change score is the preferred method of analysis (Maris, 1998; Oakes & Feldman, 2001). Change scores were calculated by subtracting the post-intervention or follow-up score from the pre-intervention score so that positive change scores are indicative of improvement in belief ratings, anxiety, avoidance or symptoms and are reported in Table 2.

3.3. Associations between learning styles and change scores

Within the BE condition ($n = 31$) the AE learning style (matched) was significantly positively correlated with change in one of the belief ratings (Belief 2) from pre- to post-intervention ($r = 0.36$, $p = 0.05$), and pre- to follow-up ($r = 0.38$, $p < 0.05$). In contrast, the AC learning style (mismatched) was negatively correlated with change in this belief rating from pre- to follow-up, although this correlation narrowly missed significance($r = -0.36$, $p = 0.06$).

Within the TR condition ($n = 28$) the AC learning style (matched) was significantly positively correlated with belief change (Belief 1) from pre- to post-intervention ($r = 0.50$, $p < 0.01$), and

Table 1
Participants' characteristics and mean pre-intervention scores (standard deviations in parentheses) for the 'mismatched' and 'matched' group.

Measure (scale)	'Mismatched'	'Matched'	Statistic	*p*-value
Characteristic				
Gender (frequency)			$\chi^2(57) = 0.27$	0.60
Women	22	26		
Men	6	5		
Age (years)	24.85(9.91)	22.39(6.91)	$t(56) = 1.11$	0.27
Ethnic group (frequency)			$\chi^2(57) = 1.52$	0.68
Caucasian	19	24		
Other	9	7		
Highest education (frequency)			$\chi^2(57) = 2.37$	0.67
BSc or more	10	13		
A-levels or less	18	18		
Previous therapy (frequency)			$\chi^2(57) = 1.33$	0.25
Yes	8	5		
No	20	26		
Pre-intervention ratings				
Belief 1 'Not washing your hands after going to the toilet will make you ill' (1–9)	6.75(1.14)	7.17(1.02)	−1.47	0.15
Belief 2 'Not washing my hands after going to the toilet will make others ill' (1–9)	6.00(1.98)	6.10(1.77)	−0.20	0.84
Situational anxiety rating (1–9)	5.43(2.06)	5.55(2.00)	−0.23	0.82
Situational avoidance rating (1–9) reversed	8.11(0.74)	7.97(1.62)	0.42	0.68
Pre-intervention scores on standardized measures				
Obsessional beliefs questionnaire (OBQ-44)	166.25(44.44)	149.45(32.84)	1.61	0.1
Irrational beliefs inventory (IBI)	152.43(20.05)	143.39(17.18)	1.87	0.07

pre- to follow-up ($r = 0.59$, $p < 0.001$). In contrast, the AE learning style (mismatched) was not significantly correlated ($r = 0.26$, $p = 0.18$) with outcome for participants that received the TR intervention. There were no significant correlations between learning styles and change in anxiety and avoidance ratings.

3.4. Comparison of the change achieved by 'matched' and 'mismatched' groups

T-tests were used to compare the size of change achieved by the matched and mismatched groups. For the primary outcome measure (belief rating: Belief 1) the matched group achieved significantly more change than the mismatched group from pre-intervention to follow-up ($t[56] = 1.99$, $p < 0.05$, $d = 0.53$). Similarly, the difference between the change achieved by the matched and mismatched groups from pre-intervention to post-intervention approached significance in favor of the matched group ($t[56] = -1.75$, $p = 0.09$, $d = 0.46$) for Belief 1. For Belief 2 there was a trend that approached significance for the matched group to achieve more change than the mismatched group from pre-intervention to follow-up ($t[56] = 1.69$, $p = 0.09$, $d = 0.45$). There were no significant differences between the matched and mismatched groups in the change achieved in ratings of anxiety and avoidance, or on the IBI or OBQ-44.

4. Discussion

This study used a retrospective design to investigate the effect of CBT interventions that were matched or mismatched to the participant's learning style. The main findings were first, that for participants in the behavioral experiment (BE) intervention group, the more they endorsed an active experimentation learning style (i.e., the learning style matched to their intervention type), the more belief change they achieved, for beliefs related to others. In addition, this group showed a trend level negative association ($p < 0.06$) suggesting that the more participants' favored an abstract conceptualization learning style (i.e., learning style mismatched to the intervention), the less they benefitted from the BE intervention. Second, for participants in the thought record (TR) intervention group, a similar pattern was obtained for beliefs

Table 2
A comparison of the mean amount of change achieved by the 'mismatched' and 'matched' groups (standard deviations in parentheses).

Measure (scale)	Time point	Group		t (53)=	*p*-value	Effect size Cohen's *d*
		'Mismatched'	'Matched'			
Ratings						
Belief 1 'Not washing my hands after going to the toilet makes me ill.' (1–9)	Pre-post	1.71(1.46)	2.37(1.38)	−1.75	0.09	0.46
	Pre-follow	1.62(1.50)	2.34(1.20)	−1.99	0.05	0.53
Belief 2. 'Not washing my hands after going to the toilet makes others ill.' (1–9)	Pre-post	1.17(1.87)	1.70(1.76)	−1.09	0.28	ns.
	Pre-follow	1.38(1.58)	2.03(1.27)	−1.69	0.09	0.45
Situational anxiety rating. (1–9)	Pre-post	0.61(1.47)	0.29(2.12)	0.66	0.51	ns.
	Pre-follow	0.96(1.48)	0.67(2.04)	0.61	0.54	ns.
Situational avoidance rating. (1–9) reversed	Pre-post	0.89(1.60)	0.55(1.21)	0.94	0.35	ns.
	Pre-follow	0.46(1.33)	0.90(1.77)	1.03	0.31	ns.
Standardized measures						
OBQ-44	Pre-post	11.11(17.58)	8.71(14.44)	0.58	0.57	ns.
	Pre-follow	13.34(20.07)	11.47(17.64)	0.41	0.68	ns.
Irrational beliefs: IBI	Pre-post	4.14(8.83)	0.90(6.11)	1.65	0.1	ns.

related to the self, whereby more belief change was demonstrated by those who reported a stronger match with the corresponding learning style (abstract conceptualization). Third, group comparisons between matched (i.e., AE style with BE intervention and AC style with TR intervention) and mismatched (i.e., AC style with BE intervention and AE style with TR intervention) participants revealed a broadly similar pattern of results, with the matched participants showing significantly more change on some belief measures than the mismatched participants. However, there were no differences between those who were matched or mismatched to their intervention on ratings of anxiety or avoidance, or on the symptom measures.

Results from this study must be interpreted with caution for several reasons. First, the retrospective nature of the analysis means that participants were not randomly allocated to matched or mismatched groups. Second, it is a limitation of the study that the 'intervention' was only a single-session of 30 min duration, so the change that was likely to be achieved is limited, reducing the power to detect differences between the groups. Indeed this is the most likely explanation for why the pattern of results we report was found on some, but not all measures. In addition, in order to standardize the intervention across participants, a non-clinical sample was used and thus the low level of baseline symptoms meant that the scope for symptom reduction was correspondingly less (i.e., a possible 'floor effect'). In addition, while hand washing after using the toilet is a public health concern, it is not a clinical problem in itself and the mechanisms involved might be different to those involved in clinical problems. It is not yet known whether results from this study generalize to clinical problems. Hence, the conclusions that can be drawn from this preliminary study must be tentative.

Nevertheless, results indicate that further investigation of the impact of learning style on outcome from CBT interventions is warranted, using clinical samples and higher dose interventions, to determine whether greater clinical relevance results in stronger findings. Results from the current study broadly supported our hypothesis in that there appeared to be a slightly greater belief change when the intervention was matched to the individual's preferred learning style. This is consistent with the matching theory hypothesis of Babor (2008). Hence it may be that in order to optimize the effectiveness of CBT interventions, therapists could attempt to take the patient's learning style into account and favor interventions that are consistent with this style. In particular, patients who show active experimentation as their preferred mode of learning may possibly benefit more from behavioral experiments. In contrast, those who naturally favor more abstract, conceptual forms of learning are possibly best suited to interventions involving thought record techniques.

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