Illness perceptions and treatment outcomes in Hepatitis C

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Objectives. Investigate the ability of illness perceptions to predict Hepatitis C (HCV) treatment outcomes, after first controlling for relevant HCV clinical and demographic data.

Method. Thirty two participants with HCV completed two online questionnaires at Time 1 (pre-HCV treatment) and Time 2 (three months post commencement of HCV treatment). Time 1 online survey collected HCV clinical and demographic data and measured the illness perceptions of participants. Based on the self-regulatory model of illness (SRM), the eight-component structure of the Brief Illness Perception Questionnaire (BIPQ) (Broadbent, Petrie, Main, & Weinman, 2006), which included illness consequences, timeline, personal and treatment control, illness identity, concern, coherence or understanding, emotional response, and causality, was utilised. Time 2 online survey assessed (1) HCV treatment adherence and (2) HCV treatment response.

Results. Treatment control perceptions emerged as the singular illness perception to predict HCV treatment outcome. The only HCV clinical data to contribute to variance in treatment outcome results were substance use and reported mental health comorbidity .

Conclusions. Results demonstrate the important role of illness perceptions in predicting HCV treatment outcomes, and provide support for including HCV pre-treatment psychological interventions to address maladaptive illness perceptions for individuals preparing for HCV treatment.

Hepatitis C (HCV) is a high prevalence blood borne disease, often chronic in nature that can potentially be associated with a number of physical comorbidities such as cirrhosis of the liver, hepatocellular carcinoma, musculoskeletal pain, and cognitive impairment (Barkhuizen et al., 1999; Chen & Morgan, 2006; Forton, Taylor-Robinson, & Thomas, 2003; Glacken, Coates, Kernohan, & Hegarty, 2003; Hoofnagle, 1997; Koziel, 2005; Lehman & Cheung, 2002; Mendez et al., 2001; Ramalho, 2003), and psychological comorbidities such as depression and anxiety (Chapko et al., 2005; Chen & Morgan, 2006; Fried et al., 2002; Hauser, Zimmer, Schiedermaier, & Grandt, 2004; Lee & Harrison, 2005; Shiffman et al., 2004; Simmonds, 2001). Despite the potential for individuals to clear HCV through anti-viral treatment regimens, variance in treatment outcomes remain,

and unlike other types of Hepatitis, such as Hepatitis B (HBV), no vaccine currently exists to protect individuals from contracting HCV (Coppola et al., 2004; Shiffman et al., 2004).

Recent estimates suggest that approximately 170 million individuals have been infected with HCV worldwide (Lee & Abdo, 2003; Shiffman et al., 2004). Due to data collection limitations, the exact number of individuals infected with HCV in New Zealand remains unknown. Despite these limitations that are largely related to many cases of HCV remaining undiagnosed, it has been estimated that in New Zealand, approximately 54,000 individuals are currently living with HCV (Gane et al., 2014). This is compared to Australia, where it has been estimated that approximately 270,000 individuals are living with chronic cases of HCV (Gane et al., 2014). Further, estimates of HCV

prevalence in New Zealand related to ethnicity have suggested that the vast majority of reported cases of HCV come from individuals from a European background (approximately 76%), compared to 15% of reported cases from within the Maori population, and 1% of reported cases coming from within the Pacific Islander population (New Zealand Health Information Service, 2001). By comparison, in Australia, estimates of HCV prevalence among individuals from an indigenous background have been problematic to determine due to a number of data collection limitations, including in many cases, the lack of a requirement to include reporting of ethnicity in many states and territories when reporting acute HCV infection (National Centre in HIV Epidemiology and Clinical Research, 2007).

At the time data were collected for the present study, the standard treatment protocol for HCV included interferon (once weekly self-administered intramuscular injection), ribavirin (daily oral self-administered medication), and depending on pre-treatment medical assessment results, an additional protease inhibitor drug (either boceprevir or telaprevir) (Jacobson et al., 2012; Shiffman et al., 2004; Thompson, 2016; Wackernah, Lou, & Park, 2011). Similar to ribarvirin, boceprevir and telaprevir require the individual to take an oral tablet on a daily basis for the required treatment period (Jacobson et al., 2012). Treatment periods for individuals undergoing interferon, ribavirin and protease inhibitor HCV treatment can be between 12 to 48 weeks depending on pre-treatment medical assessment results (e.g., cirrhosis of the liver typically requires longer treatment) (Jacobson et al., 2012; Wackernah et al., 2011). Further, for individuals preparing for interferon based HCV treatment, a comprehensive psychosocial assessment is often required, in addition to other pre-

treatment bio-medical assessments, to determine the individual's psychological preparedness for HCV treatment (Thompson, 2016). The rationale for the inclusion of pre-treatment psychosocial assessments is primarily due to the potential for interferon to exacerbate existing mental health conditions, cause endogenous depression, or in rare cases psychosis. (Holmes, Thompson, & Bell, 2013; Sarkar, Sarkar, Berg, & Schaefer, 2015; Wackernah et al., 2011).

More recently, a new interferon free generation of direct-acting anti-viral medications (eg., sofosbuvir, ledipasvir, and daclatasvir), with fewer reported side effect profiles and higher HCV clearance rates in comparison to interferon based treatment protocols has become available in Australia (Thompson, 2016). However, interferon based HCV treatment protocols remain the standard treatment for HCV in many countries across the world, including New Zealand (Gane et al., 2014; Wackernah et al., 2011). It is also important to note that in Australia, the newer generation direct-acting anti-viral medications are only currently funded under the national pharmaceutical benefits scheme (PBS), to treat individuals with HCV genotypes 1, 2 or 3 (Thompson, 2016). Individuals with HCV genotypes 4, 5, or 6 currently remain ineligible to receive subsidised treatment under the PBS for the newer direct-acting anti-viral medications and will need to continue to receive interferon based HCV treatments for the foreseeable future (Thompson, 2016). Similar inequities exist related to access to newer generation direct-acting anti-viral medications in other parts of the world largely based on treatment cost issues (Gane et al., 2014). For example, in the United States of America, access to the newer generation of direct-acting HCV anti-viral medications is in most cases dependent on the individual's ability to maintain relevant private health insurance cover (Canary, Klevens, & Holmberg, 2015). Further, in many developing countries interferon based HCV treatment protocols continue to remain the standard treatment for HCV, largely due to the cost-prohibitive nature of the newer direct-acting anti-viral HCV treatment protocols (Luhmann et al., 2015).

To date much of the research in HCV

has focussed on developing bio-medical treatment prediction models (Chen & Morgan, 2006; Lee & Abdo, 2003; Shiffman et al., 2004). For example, Shiffman et al. (2004) conducted research to determine which individual demographic and bio-medical factors predicted treatment outcomes among a group of previous treatment non-responders. Results showed that: (1) previous treatment with interferon monotherapy, (2) HCV genotypes 2 or 3, (3) lower HCV serum levels, (4) achievement of a 12 week early viral response, (5) an AST: ALT ratio less than 1.0, (6) the absence of cirrhosis of the liver, along with the following behavioural predictors: (1) medication adherence, and (2) dosage compliance were all associated with an increased probability of the individual achieving a sustained viral response . By definition, an individual attained a sustained viral response if they achieved 'nil HCV detected' in two sequential blood tests measured at end of treatment and then at six months post end of treatment (Lee & Abdo, 2003; Shiffman et al., 2004). Similarly, Lee and Abdo (2003) identified the individual demographic and bio-medical factors that are important in predicting antiviral treatment response among individuals undergoing treatment for HCV. Their review of the HCV treatment literature revealed that: (1) HCV genotypes 2 or 3, (2) lower HCV serum levels, (3) combined interferon and ribavirin therapy, (4) shorter duration of HCV infection, (5) younger age (<40 years), (6) body weight (BMI within normal range), (7) the absence of illicit drug use, (8) the absence of cirrhosis or fibrosis of the liver, (9) lower hepatic iron levels, (10) low HCV heterogeneity, (11) female gender, (12) a low AST:ALT ratio, (13) the absence of both medical and mental health comorbidity, and (14) a 4 week rapid viral response or a 12 week early viral response, were all associated with an increased probability of the patient achieving a sustained viral response (Lee & Abdo, 2003).

In comparison to research into the biomedical markers of recovery from HCV, a relative paucity of research has focussed on potential psychosocial contributions to HCV treatment outcomes (Hagger & Orbell, 2003). This is despite a growing body of literature that has

demonstrated the value of psychosocial contributions in explaining variance in both psychosocial adjustment and bio-medical treatment outcomes across a wide range of chronic diseases (Chilcot, Wellsted, & Farrington, 2011; van Diijk et al., 2009). For example, with respect to psychosocial adjustment, Rutter and Rutter (2002) demonstrated the ability of illness perceptions and coping strategies to account for variance in adjustment outcomes among a cohort of individuals with irritable bowel syndrome. Further, Chilcot et al. (2011) investigated the ability of illness perceptions to predict survival rates among a cohort of individuals with end stage renal disease. Chilcot et al. (2011) identified perceptions related to treatment control as an important predictor of survival independent of the contribution of other clinical markers.

In light of the limited research that has evaluated the role of psychosocial contributions in HCV treatment outcomes, the primary aim of the current study was to examine whether illness perceptions of individuals undergoing anti-viral treatment for HCV can account for variance in treatment outcomes. Illness perceptions represent attempts individuals make to understand or make sense of their respective illness experiences. Illness perceptions inform and influence subsequent coping behaviours which are linked to health related outcomes (Broadbent et al., 2006). Illness perceptions form part of Leventhal's Self-Regulatory Model (SRM) (Leventhal, Meyer, & Nerenz, 1980) and include illness consequence, timeline, personal and treatment control, illness identity, concern, coherence and emotional response (Broadbent et al., 2006; Leventhal et al., 1980). Research utilising the SRM has demonstrated its efficacy to predict biopsychosocial outcomes across a number of chronic illness areas including irritable bowel syndrome (Boddington, Myers, & Newman, 2002), diabetes (Cartwright & Lamb, 1999), chronic fatigue syndrome (Heijmans, 1998), Addison's disease (Heijmans, 1999), human immuno-deficiency virus (HIV) (Horne, Cooper, Fisher, Buick, & Weinman, 2001), epilepsy (Kemp, Morley, & Anderson, 1999), asthma (Horne & Weinman, 2002), rheumatoid arthritis (Moss-

Morris et al., 2002), cancer (Rees, Fry, & Cull, 2001), chronic obstructive lung disease (Scharloo et al., 1998), multiple sclerosis (Schiaffino & Cea, 1995), atrial fibrillation (Steed et al., 1999), and hypertension (Theunissen & de Ridder, 2001).

The present study tested the hypothesis that illness perception features of the SRM would contribute to variance in HCV anti-viral treatment outcomes.

Method

Participants

The first pre-treatment survey was completed by 126 individuals with HCV who were recruited via the study website. Out of this cohort, 32 participants completed the second survey post-commencement of HCV treatment. A number of recruitment strategies were utilised, including internet-based advertising methods (e.g., contacting Hepatitis C peak body websites across Australia), in addition to traditional hard-copy advertising flyers mailed to the residences of individuals preparing for HCV treatment at the Gold Coast University Hospital liver clinic. Inclusion criteria included a current HCV diagnosis, at least 18 years of age (HCV treatment is not available to individuals under the age of 18), access to the internet, and a current e-mail address. Ethical approval and informed consent was obtained prior to data collection. Table 1 summarises clinical, behavioural and demographic information.

Measures

Clinical, behavioural and demographic information. Participants at Time 1 responded to specific questions related to age, weight, HCV genotype, gender, and most likely route of HCV infection. Further, participants provided Time 1 yes/no responses to the following socio-demographic and clinical questions: (1) *"Did the liver biopsy or scan results indicate the presence of cirrhosis of the liver?"* (2) *"Do you have any other medical conditions that you are currently receiving treatment for?"* (3) *"In the past week, have you used recreational drugs?"* (4) *"In the past week, have you consumed any alcohol?"* (5) *"In the past week, have you smoked any cigarettes?"* (6) *"Do you have any mental health condition/s that you are currently receiving medication based treatment for?"*(e.g. depression/anxiety/psychosis), and (7) *"Have you ever had previous treatment for Hepatitis C?"* Further, at Time 2, participants responded with a yes/no to the following question related to treatment adherence: *"In reference to taking your Hepatitis C medication since commencing treatment; during the first 12 weeks of treatment, did you take your medication as prescribed?"*

Illness perceptions. Illness perceptions were measured using the Brief Illness Perception Questionnaire (BIPQ: Broadbent et al., 2006). The BIPQ has eight items (a ninth item that assesses causality using an open ended question was not included in the present study), each of which is rated on an 11-point Likert scale. Scores on each

item range from 0 to 10. Sample items from the BIPQ include *"How much does your illness affect your life?"* and *"How concerned are you about your illness?"* (Broadbent et al., 2006). For the present study, the word *"illness"* was substituted with *"HCV"*. Scoring was performed for each of the eight illness perception items, with five items measuring cognitive illness representations (illness consequences, timeline, personal control, treatment control, and identity), two items measuring emotional representations (concern and emotions), and one item measuring illness coherence or understanding. Higher scores on the illness consequence, timeline, identity, concern and emotions subscales are indicative of more negative or threatening illness perceptions. Conversely, higher scores on the personal control, treatment control and illness understanding subscales indicate more positive illness related perceptions. The BIPQ has shown good test-retest reliability and concurrent validity along with good predictive and discriminant validity (Broadbent et al., 2006).

Outcome Assessment. HCV treatment response was the outcome measure evaluated at Time 2 (post commencement of HCV treatment). At Time 2, participants were asked to indicate what blood tests (known as 'PCR' tests) they had since commencing HCV treatment, and to indicate the outcome for each test. Three questions covered week four, week eight, and week twelve PCR blood tests respectively. For each question, participants were asked to indicate either (1) 'Hepatitis C virus was detected in my blood' or (2) 'Hepatitis C virus was not detected in my blood'. A response indicating nil detection of HCV for at least one of the three milestone PCR blood tests was recorded as a 'treatment response' result for future statistical analysis. Due to the somewhat fluid nature of an individual's response to HCV treatment, not all patients achieve a 'treatment response' following week four or week eight 'PCR' tests. Importantly, failure to achieve a treatment response at the week 12 milestone 'PCR test', following on from previous non-response to treatment measured at week four and week eight 'PCR' tests, will in most cases lead to the discontinuation of treatment (Chen & Morgan, 2006; Lee & Abdo,

Table 1
Demographic, behavioural and clinical data (N = 32)

Characteristic	n	(%)	M	SD
Age			43.3	13.5
Weight (KG)			78.6	16.1
Gender				
Male	13	40.6		
Female	19	59.4		
Treatment adherence	30	93.8		
IV drug use route	11	34.4		
Cirrhosis (n =23)	7	30.4		
Genotype 1 (n = 26)	14	53.8		
Previous HCV treatment	8	25.0		
Medical co-morbidity	12	37.5		
Recreational drugs	7	21.9		
Alcohol use	8	25.0		
Smoking tobacco	10	31.3		
Mental health condition	7	21.9		

Procedure

Volunteers were directed to the study website. After providing informed consent they were given a unique personal login identifier and password that granted access to the first pre-treatment questionnaire (Time 1). Time 1 questionnaire required participants to respond to the BIPQ. Relevant clinical and demographic information was also collected (refer Table 1) at Time 1. Completion of the Time 1 survey took between 30 and 40 minutes. Participants were followed up three months post commencement of HCV treatment and were invited to complete a second online survey questionnaire (Time 2). At Time 2 participants responded to questions related to HCV treatment outcome, and to treatment adherence relevant to the treatment period. The Time 2 online survey took between 5 and 10 minutes to complete.

Statistical Analysis

An alpha level of .05 was utilised to determine statistical significance. Prior to the main tests, all variables were examined for accuracy of data entry, missing values, and fit between their distributions and assumptions of regression analysis. Preliminary analyses suggested the data were reasonably normally distributed. One-way ANOVA and independent t-tests were used to assess for gender differences on the measures. Results indicated that there were no significant gender differences therefore data analyses for the study were performed on the sample as a whole. Due to attrition between Time 1 (n=126) and Time 2 (n=32), independent samples t-tests, chi-square analyses and Fisher's exact tests were performed to assess for differences in clinical, behavioural, and demographic characteristics (refer Table 1), between those participants who completed the post-treatment questionnaire and those who did not. The only significant result to emerge was age in years; those who completed the post-treatment questionnaire (M = 46.98 years, SD = 13.55) were significantly older than participants who only completed the pre-treatment questionnaire (M = 41.58 years, SD = 11.12), t(51) = 2.07, p = .04.

Results

Differences in Treatment Response in Clinical Bio-Medical Markers

Independent t-tests, chi-square analyses and Fisher's exact tests were used to assess differences in the variables of interest as a function of treatment response. Results revealed significant differences between treatment responders and non-responders related to use of recreational drugs (Fisher's exact test p <.05) and the presence of a mental health condition (Fisher's exact test p <.05). There were no significant differences between responders and non-responders as a function of treatment adherence (Fisher's exact test p >.05), gender (χ^2 (1, 32) = .00, p > .05), IV drug use transmission (χ^2 (1, 32) = .00, p > .05), cirrhosis of the liver (Fisher's exact test p >.05), HCV Genotype 1 (χ^2 (1, 26) = 2.59, p > .05), previous HCV treatment (Fisher's exact test p >.05), reported medical comorbidity (χ^2 (1, 32) = 1.88,

p > .05), recent alcohol use (Fisher's exact test p >.05), or regular cigarette smoking (Fisher's exact test p >.05). Treatment non-responders were not different in age (M = 42.84 years, SD = 12.48) from treatment responders (M = 43.73 years, SD = 14.91), t(30) = -.19, p = .85. Treatment non-responders did not differ in weight (M = 78.35 kg, SD = 16.58) from non-responders (M = 78.80 kg, SD = 16.03), t(30) = -.08, p = .94.

Treatment Response Differences in Illness Perception Features

To investigate differences in illness perception components as a function of treatment response, a multivariate analysis of variance (MANOVA) was performed. The eight illness perception components were included: Illness consequence, illness timeline, personal control, treatment control, illness identity, illness concern, illness coherence, and emotional response. Table 2 presents descriptive statistics, univariate F-values and effect sizes for treatment non-responders versus treatment responders on each of the dependent variables. Overall, only treatment control demonstrated a significant association with treatment response.

Multivariate Prediction of Treatment Response. A logistic regression was performed to assess whether treatment response could be independently predicted by each of the variables found to differentiate

Table 2

Means and standard deviations for the illness perception variables as a function of treatment response

Variable	No Treatment Response (*n* = 17)		Treatment Response (*n* = 15)		Univariate		
	M	*SD*	*M*	*SD*	*F*	*p*	*eta*
Illness consequence	6.24	1.95	5.73	2.71	0.37	.55	.01
Illness timeline	6.53	2.15	5.00	3.18	2.59	.12	.08
Personal Control	4.59	2.60	4.00	2.51	0.42	.52	.01
Treatment Control	6.35	1.69	7.87	1.64	6.55	.02	.18
Illness identity	5.65	2.34	4.73	2.60	1.09	.30	.04
Illness concern	7.71	1.90	7.73	2.58	0.00	.97	.00
Illness coherence	6.42	2.37	7.53	1.68	2.32	.14	.07
Emotional response	5.88	2.89	5.53	3.07	0.11	.74	.00

responders from non-responders as described above. Accordingly, mental health condition, substance use and treatment control were entered into the regression model. The full model containing the three predictor variables was statistically significant, χ^2 (3, N = 32) = 18.73, p < .001. The logistic model overall explained between 44% (Cox and Snell R square) and 59% (Nagelkerke R squared) of the variance in treatment response outcomes, and correctly classified 84% of the cases.

Table 3 indicates that all three of the predictor variables made individual and statistically significant contributions to the prediction of treatment response outcomes. More specifically, the presence of a co-morbid mental health condition, substance use, and a stronger perception in the effectiveness of HCV treatment all uniquely predicted treatment response.

Discussion

Results of the current study demonstrated the ability of illness perceptions to predict HCV anti-viral treatment outcomes. Specifically, treatment control, or perceptions related

Table 3.
Results of logistic regression for predicting treatment response in patients with HCV.

	B	S.E.	Wald	p	Exp(B)	95% CI for Exp(B) Lower	Upper
Recreational Drugs	3.75	1.69	4.93	.03	42.50	1.55	1162.22
Mental Health Condition	3.06	1.42	4.64	.03	21.22	1.32	341.89
Treatment Control	.80	.36	4.95	.03	2.22	1.10	4.49
Constant	-7.04	2.83	6.17	.01	.001		

to beliefs that HCV treatment could contribute to a favourable treatment response (i.e., significant reduction in HCV virus following milestone blood tests), predicted variance in HCV treatment outcomes. These results are consistent with Chilcot et al. (2011) who demonstrated that treatment control predicted survival rates among individuals with end stage renal disease after controlling for the impact of relevant clinical markers. Further, mental health comorbidity and substance use, made unique and significant contributions to the prediction of HCV treatment response such that the presence of mental health comorbidity and the use of substances as a coping strategy predicted more favourable treatment responses. Despite the relatively counter-intuitive direction of their contribution, these results are consistent with a number of previous studies (Chen & Morgan, 2006; Lee & Abdo, 2003; Shiffman et al., 2004) that have highlighted the important role of clinical markers within the treatment predictive framework, and are therefore worthy of future research to further investigate these respective findings.

The SRM proposes that when individuals become aware of an illness experience they construct a number of illness related perceptions in an attempt to create understanding and meaning of what is happening. These illness perceptions are then proposed to drive coping behaviours with the aim of attaining favourable illness related outcomes (Broadbent et al., 2006; Leventhal et al., 1980). Within the present study the data highlighted the important role of treatment control within the HCV treatment predictive framework. In addition to the number of clinical markers that have been identified in the literature as contributing to variance in HCV treatment outcomes, such as particular HCV genotype and BMI (Chen & Morgan, 2006; Lee & Abdo, 2003; Shiffman et al., 2004), a significant factor that contributes to HCV treatment outcomes is the ability of an individual to effectively engage in self-management behaviours whilst on treatment (Shiffman et al., 2004). For example, adherence to HCV anti-viral treatment regimens often requires self-administration of anti-viral medications on a daily basis (Lee & Abdo, 2003; Shiffman et al., 2004). Levels of motivation to engage with required treatment regimens are likely to be influenced by perceptions of the efficacy of the prescribed treatments. Therefore greater treatment control perceptions would potentially have a significant influence on adherence based coping behaviours. In other words, it would seem unlikely that an individual would adhere to the requirements associated with HCV treatment if they held low perceptions related to treatment control.

Further, the SRM supports the premise that the cognitions associated with individual illness perceptions are amenable to psychological intervention (Chilcot et al., 2011; Hagger & Orbell, 2003; Leventhal et al., 1980). The results of the present study highlight the potential importance of assessing the illness perceptions of individuals preparing for HCV treatment, and either putting in place psychological interventions that address more maladaptive illness perceptions or strengthen more adaptive illness perceptions with the aim of creating optimal psychological platforms prior to the commencement of HCV treatment. Overall, the results of the present study support previous research conducted within the context of chronic disease and demonstrate the ability of illness perceptions to contribute to treatment outcomes (Chilcot et al., 2011; Rutter & Rutter, 2002; Steed et al., 1999). Further, the current study investigated the ability of illness perceptions to predict HCV treatment outcomes independent of the impact of mental health issues and substance use. Future HCV based research of this type should include measures of illness perceptions, coping strategies and psychosocial adjustment outcomes, in addition to bio-medical treatment outcomes, to further assess the ability of the SRM to predict both psychosocial and bio-medical outcomes within a prospective research model.

Certain limitations associated with the present study need to be noted. Firstly, the relatively small sample size at Time 2 compared to the baseline sample size at Time 1. In the present study a potential problem associated with significant differences between measurement periods presented with significant differences in participant's age in years between participants who did not complete HCV treatment in time 1 compared to those who did complete HCV treatment at Time 2. One potential recommendation for future research in this area may be to consider moving away from an anonymous online data collection design used in the present study, and rather focus on clinic based, face to face data collection designs that may potentially increase response rates, particularly at follow up data collection periods. Secondly, some of the methodological limitations (e.g., potential response bias)

associated with the use of self-report yes/ no response questions for measuring clinical, behavioural and demographic information may have contributed to some of the more counter-intuitive results. Future related studies would do well to consider using standardised clinical measures as a way of potentially avoiding some of the more counter-intuitive results reported in the present study, particularly related to medication adherence, and other clinical markers such as substance use and mental health.

In Summary, the results of the present study further support the inclusion of psychological variables, as recommended within a number of related chronic disease studies (Fortune, Richards, Griffiths, & Main, 2002; Heijmans, 1999; Helder et al., 2002; Rutter & Rutter, 2002; Scharloo et al., 2000; Steed et al., 1999), within future HCV research that aims to predict treatment outcomes (Shiffman et al., 2004). In relation to clinical practice, these results further support the potential benefit of addressing maladaptive illness perceptions with the aim of improving clinical outcomes across the spectrum of physical illness.

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