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Physicians' communication of the common-sense self-regulation model results in greater reported adherence than physicians' use of interpersonal skills

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Q1

Objectives. Interventions that address patients' illness and treatment representations have improved patient adherence and outcomes when administered by psychologists and/or health educators and focused on a single chronic illness. The current study assesses the potential feasibility/effectiveness of an intervention based on the common-sense self-regulation model (CS-SRM) when administered by providers in a primary care setting.

Design. We designed a prospective, correlational study in order to optimize patients' and providers' time and to gain initial evidence of the CS-SRM-approach's feasibility/effectiveness.

Methods. Patients (n = 243) were recruited from a primary care waiting room and reported on objective behaviours of their providers (providers' CS-SRM-related behaviours and interpersonal skills) and other theoretically related measures directly after the medical encounter and reported on adherence, presenting problem resolution, and emergency care usage 1 month later.

Results. The more providers gave their patients an adaptive understanding of their presenting problem/treatment (the greater the number of CS-SRM-related behaviours they engaged in), the more adherent were patients in the month following the encounter and the better was their problem resolution 1 month later. The CS-SRM-related behaviours were more predictive of these outcomes and emergency care usage than were the providers' interpersonal skills.

Conclusions. In the time-limited encounter, interventions may have to prioritize theoretical approaches for attaining patient adherence. The current study, although correlational, indicates that addressing the patients' illness/treatment representations is

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more important than the providers' interpersonal skills for attaining patient adherence and provides preliminary evidence that a CSM-based intervention in the primary care setting may be both feasible and effective.

After over 40 years of research (Blackwell, 1973; Haynes *et al.*, 2005), patient non-adherence and its related health problems remain contemporary topics. A systematic review of medication adherence found that roughly 20–50% of patients are non-adherent to prescribed treatment, resulting in poorer medical outcomes, higher healthcare costs, and higher rates of emergency-care usage (Kripalani, Yao, & Haynes, 2007). The pervasive effect of treatment non-adherence on healthcare in general has led adherence to be called 'the key mediator between medical practice and patient outcomes' (Kravitz & Melnikow, 2004, p. 197).

McDonald, Garg, and Haynes (2002) in a systematic review of randomized controlled intervention trials concluded that the percentage of interventions that had significant effects on adherence was small – and on treatment outcomes even smaller. Furthermore, those significant effects were only of modest size, and the interventions that obtained them were often very complex and labor intensive. As argued by Leventhal, Weinman, Leventhal, and Phillips (2008), what is needed in health psychology and in the medical field is an emphasis on designing effective interventions that are also efficient, utilizing translational research from the laboratory to the clinic, and vice versa.

Many (e.g., Hale, Treharne, & Kitas, 2007; Wearden & Peters, 2008) have advocated the common-sense self-regulation model (CS-SRM; Leventhal, 1970; Leventhal, Brissette, & Leventhal, 2003) as a basis for successful interventions to improve patient adherence due to the empirically supported relationship between patients' own illness and treatment representations and their adherence to prescribed treatments (Heurtin-Roberts & Reisin, 1992; Horowitz, Rein, & Leventhal, 2004; Meyer, Leventhal, & Gutmann, 1985). Patients' illness/treatment representations, as posited by the CS-SRM, have five domains into which their health and illness beliefs fall: identity (illness label/diagnosis; symptoms that are associated with the illness), cause (environmental, biological, or lifestyle factors), timeline (duration and trajectory of the illness: acute, chronic, or cyclical), control (actions taken by patients and/or doctors that are expected to control symptoms), and consequences (side effects; social and financial costs). Their beliefs may be specific to the illness and/or to the treatment, the latter of which have been shown to be particularly predictive of treatment adherence (Horne, Weinman, & Hankins, 1999). Patients' representations are dynamic, because patients are active problem solvers in their own health, and patients' beliefs change with his/her treatment related and other experiences (Leventhal, Breland, Mora, Leventhal, 2010; Wearden & Peters, 2008). The CS-SRM 'implies that patients with acute and chronic illness can be helped to achieve better outcomes when they have a more adaptive understanding of their condition and are able to evaluate the effects of acting on this understanding' (Wearden & Peters, 2008). How providers might be able to give their patients a more adaptive understanding of the condition and its treatment is the focus of the current investigation.

Q2

Interventions to align patient's CS-SRM beliefs (illness/treatment representations) with medical knowledge and to provide patients with the adaptive understanding required to manage their own health are increasingly prevalent. Skills in management require that patients monitor the progression of their illness with treatment and distinguish signs of improvement from signs of worsening and the symptoms associated with treatment (e.g., mild breathlessness when starting an exercise regimen is not a

symptom of a heart problem; Petrie, Cameron, Ellis, Buick, and Weinman, 2002). Petrie *et al*. (2002) tested such a CS-SRM-based intervention, which was administered by a psychologist to patients who were in the hospital for a myocardial infarction (MI). Intervention patients felt significantly more prepared when leaving the hospital, returned to work significantly sooner, and had significantly fewer MI-related symptoms 1 month after the hospital visit than did control patients. McAndrew *et al*. (2008) discuss two ongoing CS-SRM-based interventions for asthma and diabetes. Both interventions focus on setting up 'experiments' or demonstrations of illness management with which the patients can learn to be self-managers. For example, the diabetes intervention helps patients to monitor how different foods and activities raise or lower their blood sugar. The asthma intervention helps patients with asthma to associate the treatment with changes in lung function through use of a peak-flow meter and subjective estimation of their ability to climb stairs, etc.

These CS-SRM-based interventions and others have so far focused on single chronic illnesses and have typically been administered by psychologists or nurses outside of the medical encounter. The current study is the first to investigate the feasibility and potential effectiveness of a CS-SRM-based intervention approach for use by providers within the primary care encounter (a wide variety of patients, illnesses, and treatments) and to compare its likely effectiveness to a interpersonal skills-based approach. The current study is not yet an intervention but a prospective, observational study. The primary aim of the current study is to assess whether the following CS-SRM-related behaviours of providers (as reported by the patients), which theoretically give patients an adaptive understanding of their presenting problems, can predict patient adherence and health outcomes in the month following the medical encounter better than can the providers' interpersonal skills: discussing the causes of the presenting problem with the patient, discussing the signs of whether or not the treatment is working, helping patients form action plans for fitting their treatment into their daily routines, teaching patients how to monitor for trouble signs that may indicate follow-up care is required, and giving patients expectations for the likely duration of the treatment and presenting problem (e.g., when symptoms should improve, when treatment should be stopped).

Interpersonal skills, or colloquially 'bedside manner' of the medical provider, include behaviours that function to treat the patient in a humanistic manner, such as the provider's expression of his/her own emotions and perception of the patient's emotions during the medical interaction, whether or not the doctor shows concern about the patient's happiness and family life, and communication style of the provider, including tone of voice, eye contact, and touch (DiMatteo *et al*., 1993; Roter, Frankel, Hall, & Sluyter, 2006). Provider interpersonal skills have received much attention in the literature as a likely mechanism for attaining patient adherence and outcomes – most likely through increased patient satisfaction (Kinmonth, Woodcock, Griffin, Spiegal, & Campbell, 1998; Lings *et al*., 2003).

Interpersonal skills based interventions are not necessarily contradictory to CS-SRM-based interventions. Indeed, the cognitive hypothesis model of compliance (Ley, 1988) states that compliance, now more commonly referred to as adherence, is dependent in part on patients' satisfaction with the consultation and providers' emotional support and understanding as well as with the information given to them (causes of the illness, process required for treatment, etc). However, given the time constraints of the encounter, prioritization of behaviours is likely required. Indeed, a randomized, diabetes intervention trial by Kinmonth *et al*. (1998) showed that in comparison to a control group receiving standard medical care, the interpersonal skills-based intervention group

reported better communication with doctors, greater well-being, and greater satisfaction but *poorer* health outcomes, such as higher BMI and triglyceride levels and lower knowledge scores (with no difference between groups on glycemic control). Despite the uncertain evidence, teaching interpersonal skills to medical students, residents, and to providers has become a priority in the field as has a primary focus on obtaining patient satisfaction (Branch *et al*., 2009; Kern *et al*., 2005). The providers' interpersonal skills will be compared to their CS-SRM-related behaviours in the current study, because comparison of theoretical mechanisms for attaining patient adherence is useful in determining the prioritisation of interventions to be used in the encounter.

A composite measure of patient reports of the providers' CS-SRM-related behaviours is used in the current study to: (1) concurrently assess associations between the providers' CS-SRM-related behaviours and theoretically related constructs, including patients' perceived agreement with the provider regarding the illness and treatment, change in patients' understanding of the illness from before to directly after the encounter, and patient satisfaction with the encounter (hypothesis: all positive and significant relationships); (2) prospectively predict patient adherence, presenting problem resolution, and follow-up emergency care utilization in the month following the encounter (hypothesis: significant positive prediction of adherence and resolution; significantly less emergency care usage); (3) compare the predictive power of the providers' CS-SRM-related behaviours to that of the providers' interpersonal skills for the main outcomes of interest (hypothesis: CS-SRM-related behaviours will more strongly predict adherence and problem resolution than will interpersonal skills).

Method

A primary care provider, three health psychologists, and a sociologist constructed the items of all study measures, except for the measure of patient adherence.

Participants and procedure

The current study was part of a larger study that was conducted from the summer of 2007 to the winter of 2008 in an internal medicine, primary care practice at a university medical centre. Patients were approached and consented while waiting for their clinic visits. Interviewers recruited patients 3 days a week, both mornings and afternoons; during these times, all patients were approached regardless of their reason for the visit, and 56% volunteered and completed informed consent forms. The majority of patients who did not consent were patients seeing providers in an adjacent department who were not eligible for the study (eligibility was determined at contact). The majority of the 402 patients who consented to participate were female (63%), white (63%), African American (14%), other (Hispanic, Asian, 8%), not reporting race (15%). They ranged in age from 18 to 90 years with an average of 61 years ($SD = 15.78$). Less than 1% had no insurance, and less than 3% did not graduate high school or earn a GED (equivalent high school degree); 55% had at least 4 years of college-level education. Nearly 26% of the total sample had no chronic illness, 38% had only one chronic illness, and 36% had two or more chronic illnesses. The study sample was representative of the population accessing the primary care facility. Providers were all primary care physicians on faculty or residents of the clinic.

Data were collected via phone at two time points: within 24–48 hr of the encounter, and again 1 month after the encounter, or as soon as possible after that time. The

Table 1. Correlations between study variables are presented in the table. Diagonal entries, in italics, are the reliability coefficients for all composite measures

	1	2	3	4	5	6	7	8
(1) Patient report: providers' CS-SRM-related behaviours.	*0.79*							
(2) Patients' perceptions of agreement.	0.37	*0.80*						
(3) Change in patients' general understanding.	0.46	0.32	–					
(4) Patient satisfaction.	0.32	0.57	0.26	*0.68*				
(5) Patients' adherence (MARS).	0.25	0.19	0.11	0.18	*0.72*			
(6) Relative problem resolution.	0.24	−0.15	0.11	−0.08	0.18	–		
(7) Absolute problem resolution.	0.17	0.11	0.14	0.08	0.16	0.47	–	
(8) Patient reports of providers' interpersonal skills.	0.23	0.33	0.25	0.58	0.23	−0.06	−0.09	*0.75*

Note. Correlations greater than or equal to .13 are significant at $p < .05$.

first interview assessed all measures described below except for the outcomes patient adherence, presenting problem resolution, and emergency care utilization, which were assessed in the second interview 1 month after the encounter. Of the 402 participants who consented to participate before the encounter, 346 (86%) completed the first phone interview, and 327 (81%) completed the second phone interview. The patients who were lost to follow-up did not differ from patients who participated in the entire study on any of the baseline variables. As primary care medical encounters are highly varied and do not always result in a prescribed treatment (some result in lab tests being ordered or involve only physical exams and checkups regarding continuing conditions/treatments), the current analyses were limited to the 243 patients for whom a treatment was prescribed at the encounter. The 84 patients with complete data who were not prescribed a medication during the encounter did not differ from the 243 patients included in the final analyses on any demographic variables. Their reasons for the visit were primarily standard care, or follow-up visits, for which no new prescriptions were required.

Measures

The reliability estimates for all scales were within a conventionally acceptable range and are presented in Table 1. See *Results* section for more validity and reliability information.

Providers' CS-SRM-related behaviours

Seven items, rated by the patient, assessed whether the provider worked with the patient to give him/her an adaptable understanding of his/her presenting problem and the prescribed treatment: (1) 'The doctor discussed with me what might be the cause' (Cause domain), (2) 'The doctor told me what s/he was looking for during the physical exam' (Identity domain), (3) 'The doctor told me how long I could expect to have this problem' (Timeline domain), (4) 'The doctor gave me clear instructions about my treatment: what to do, when, how often, and for how long' (Control and Timeline domains), (5) 'The doctor told me what I might expect when taking my medication/treatment' (Consequences and Identity domains), (6) 'The doctor gave me some tips to help me work my treatment into my daily routine' (Control and Consequences domain), (7) 'The

doctor told me how to monitor my problem to see if the treatment is working' (Identity and Control domain; identity provides the target for control). Each item addressed whether the provider did or did not perform the particular behaviour with a Yes/No answer choice (and a 'not applicable' option; e.g., if no physical exam was conducted, then the second question above would not be applicable), and an average of the items was calculated for the composite. Scores on the composite could therefore range from 0 to 1 with 0 = No to all applicable items and 1 = Yes to all applicable items.

Patient perceptions of agreement on the presenting problem/treatment

A composite measure of four items was designed to represent the degree to which patients perceived agreement with their provider regarding the presenting problem and prescribed treatment, all on a 5-point scale from 1 (not at all) to 5 (very much): for example, 'Overall, the doctor and I share a common understanding of the illness'.

Patient understanding. Change in general understanding was assessed with the item: 'I understand my problem better now than I did before the visit: not at all (= 1) to very much (= 5)'.

Interpersonal skills. Five items, rated by the patient, assessed providers' interpersonal skills: 'My doctor was sympathetic about my problem', 'My doctor understood my feelings about this problem', 'My doctor is a good person', 'My doctor is like a friend or family member to me', and 'My doctor is concerned about my feelings'. All items had response options from 1 (not at all) to 5 (very much), and scores were averaged for the composite measure.

Patient satisfaction. Interviewers asked participants at the beginning and at the end of the 24-hr follow-up interview about their overall level of satisfaction with the encounter (All in all, how satisfied were you with the care you received at your doctor visit?), on a scale of 1 (not at all satisfied) to 5 (very satisfied). The two items correlated $r = .69$ with each other and were consequently averaged into one composite measure.

Patient adherence. Adherence was assessed 1 month after the encounter and represented by the average of patients' responses to the five items from the Medication Adherence Report Scale (MARS-5; Horne, 2004), which measures patients' tendencies to forget, skip, or alter their treatments; for example, 'I decide to miss out on a dose: never, rarely, sometimes, often, always'. The scale has previously been shown to have sufficient reliability and both criterion and discriminant validity (George, Kong, Thoman, & Steward, 2005; Horne, 2001).

Presenting problem resolution. Presenting problem resolution was assessed with two items, one of which gauged relative resolution (Is the problem any better now: yes, no?) and the other that gauged absolute resolution (Is the problem completely gone: yes, no?). The former is more relevant for longer term acute problems and for chronic problems, and the latter is more relevant for acute problems that can be resolved in 1 month or less. The two items correlated at $r = .47$ and were not combined into a composite measure of problem resolution because of the low correlation and the distinction in applicability to

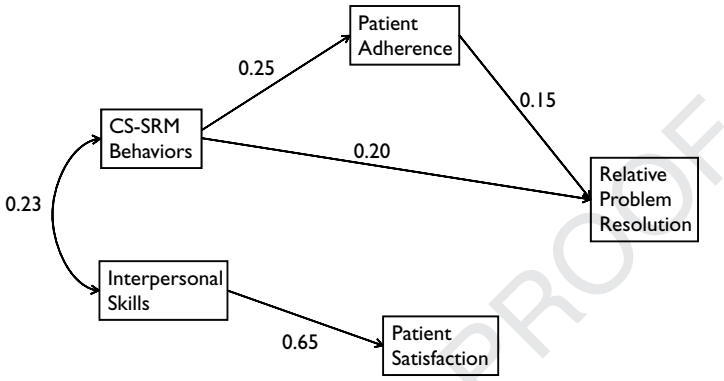

Figure 1. Path Model 1 with only the hypothesized relationships between providers' CS-SRM-related behaviours, interpersonal skills, and outcomes are included in the model. The path coefficients are standardized values.

varying presenting problems. The more generally applicable relative problem resolution was used in the theoretical comparison analyses between CS-SRM-related behaviours and interpersonal skills of the provider.

Emergency room utilization

In the 1-month follow-up interview, patients were asked whether or not they had gone to the emergency room during the month following the encounter for their presenting problem (Yes/No).

Analysis overview

Before the analyses were conducted, a provider-level effect was ruled out using random intercepts, multilevel modelling (in SPSS and in SAS software for the dichotomous outcome variables; SPSS Inc.; SAS Institute Inc.). The tests were not significant (*Wald* $Z = .10$, $p = .92$); therefore, the data were analysed assuming independence of patient observations.

The association between the providers' CS-SRM-related behaviours and other theoretically related constructs measured in the first interview after the encounter were assessed with Pearson correlations, reported in Table 1. Pearson correlations were also utilized to assess whether the CS-SRM-related behaviours of providers prospectively predicted patient adherence and problem resolution (both relative and absolute).

Causal modelling was used to compare the relationship of providers reported CS-SRM-related behaviours and interpersonal skills to patient adherence and problem resolution (relative) (LISREL; Scientific Software International). The first model describes the hypothesized, causal paths from CS-SRM-related provider behaviours to patient adherence and relative problem resolution (Figure 1). The second model includes the additional paths, hypothesized to be non-significant, from interpersonal skills and patient satisfaction to patient adherence and problem resolution (Figure 2). The hypothesis that providers' CS-SRM-related behaviours are more important for the outcomes than are the providers' interpersonal skills and/or the patients' satisfaction (the third study hypothesis) would be supported if the overall fit of the first model is acceptable (fit indices are described in the Results section) and if the addition of the four paths in Model 2 does not result in significantly better fit of the second model to the data compared to

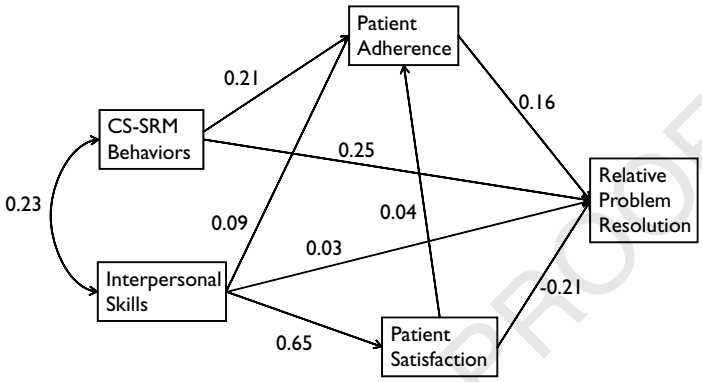

Figure 2. Path Model 2 with additional, hypothesis incongruent paths from interpersonal skills and patient satisfaction to patient adherence and problem resolution included. The path coefficients are standardized values.

the first model (i.e., if the reduction in the chi-square estimate of 'misfit' of the model is not significant). Figure 2 shows all relevant paths between variables; the hypothesis states that the paths from interpersonal skills to adherence and problem resolution and from patient satisfaction to adherence and problem resolution will be non-significant.

Two *t*-tests were used to compare the mean differences of providers' CS-SRM-related behaviours and providers' interpersonal skills between patients who reported going to the emergency room for their presenting problem and those who did not.

A *post hoc* analysis was conducted on the relationship of individual CS-SRM-related provider behaviours to patient adherence to determine if the relationship of the composite measure to patient adherence and other outcomes was due to specific items within the composite. The 95% confidence interval for the correlation between the composite and patient adherence was calculated using a Fisher's *z*-transformation, and correlations between individual items of the composite with patient adherence were assessed to see if either they fell within this confidence interval or they had a 95% confidence interval that overlapped with it. If all individual item correlations with patient adherence are not significantly different from the composite correlation with patient adherence, it would indicate that no specific items were more important than others for determining patient adherence, and the analysis would avoid many multiple comparisons between each individual item's correlation with all other individual item correlations.

Results

Besides having good internal consistencies (see Table 1), factor analyses were conducted on both the CS-SRM-related behaviours of the providers and the interpersonal skills items. Exploratory factor analyses, conducted in SPSS version 15, yielded single-factor scores for both scales with communalities all over .33 (a rough lower threshold accepted for good fit between a factor and an item; Tabachnick & Fidell, 2007). These scales also had strong face validity (items were designed and assessed by a primary care physician, three health psychologists, and a sociologist) and strong external validity, given the real-world setting and patients in which they were tested. The percentages of patients responding 'yes' to whether the provider performed the CS-SRM-related behaviours

Table 2. Fit indices for the hypothesized model, Model 1, compared to the more specified Model 2

Fit index	Model 1	Model 2
Chi-square statistic	8.93 ($df = 5$)	3.47 ($df = 1$)
RMSEA	0.083	0.147
NFI	0.91	0.96
NNFI	0.91	0.72
CFI	0.96	0.97
Standardized RMR	0.064	0.035
GFI	0.97	0.99
AGFI	0.91	0.82

were the following (in the order of numbered items in the *measures* section): 72%, 62%, 37%, 74%, 60%, 45%, and 57%.

Table 1 shows correlations between study variables (Pearson correlations, except those with problem resolution, which are point biserial). As hypothesized, patient reports of the providers' CS-SRM-related behaviours (i.e., theoretically, the degree to which providers gave patients an adaptive understanding of their illness and prescribed treatment) were significantly and positively correlated with patients' perceptions of agreement with the provider on the presenting problem and its treatment ($r = .37$, $p < .001$), change in understanding of the presenting problem from before to after the medical encounter, ($r = .49$, $p < .001$), satisfaction with the medical encounter ($r = .32$, $p < .001$), adherence ($r = .25$, $p = .007$), and problem resolution (both relative, $r = .24$, $p = .005$, and absolute, $r = .17$, $p = .04$).

Figure 1 shows the path diagram that represents the hypothesized relationships between variables. All path coefficients are significant ($p < .05$) in this model, but more importantly, the fit of the model is good. The fit indices for this model are presented in Table 2, and RMSEA is generally considered to indicate acceptable fit of a model at .10 or lower, standardized RMR is considered to indicate good fit at .08 or lower, and the other fit indices (CFI, NFI, NNFI, GFI, AGFI) are considered to indicate good fit at .90 or higher (McDonald & Ho, 2002). Furthermore, addition of the four additional paths from interpersonal skills and patient satisfaction to patient adherence and problem resolution, represented in Figure 2, did not significantly improve the fit of the model to the data (decrease in $\chi^2(4) = 5.36, p = .26$), indicating that the additional paths were not needed. That is, the first model is most parsimonious. The fit indices of the second model can be compared to the first in Table 2.

Even though the overall and relative fit of the second model was generally poorer compared to the first model, supporting our hypotheses, it is important to note that the second model's fit is even worse *conceptually* than reflected in the fit indices, as patient satisfaction and problem resolution are significantly, negatively related. That is, the modelling program cannot take into account the fact that the relationship between patient satisfaction and problem resolution is in the opposite from expected direction; the fit indices merely reflect that the addition of a path from satisfaction to problem resolution would improve the fit of the estimated to the observed covariance matrix. The results of the causal modelling provide even stronger support therefore for the theoretical hypotheses than do the fit indices.

Very few patients reported going to the emergency room for their presenting problems during the month prior to the final follow-up interview. Despite the small

number of cases ($n = 14$), the average patient ratings of providers' CS-SRM-related behaviours were significantly lower for patients who went to the emergency room compared to those who did not go to the emergency room ($t = 2.03$, p(two-tailed) $= .04$); there was no significant difference between the interpersonal skills ratings of patients who went to the emergency room and those who did not ($t = 1.35$, p(two-tailed) $= .18$).

The 95% confidence interval for the correlation between the composite CS-SRM-related provider behaviours and patient adherence was (.13, .38). The *post hoc* analyses of correlations between individual CS-SRM-related behaviours of the provider and patient adherence did not reveal any correlations that were outside of this 95% confidence interval or whose 95% confidence intervals did not overlap with it.

Discussion

The purpose of the current study was to provide preliminary evidence for the feasibility and effectiveness of a CS-SRM-based intervention approach for use by providers in the primary care setting to improve patient adherence and health outcomes – specifically compared to a interpersonal skills-based approach. We hypothesized that the providers' CS-SRM-related behaviours, or the degree to which the provider discussed aspects of the presenting problem and prescribed treatment with the patient in order to give him/her an adaptive understanding of the problem, would both concurrently and prospectively predict theoretically related constructs and outcomes of interest. As hypothesized, the more CS-SRM provider behaviours patients reported, the more likely patient's perceived agreement with their provider regarding the problem and treatment, the greater the improvement in patient's reports of understanding the problem from before to after the encounter, the greater the satisfaction with care received, the greater the adherence to prescribed treatment the month after the encounter, and the more likely patient's reported that their problem was better and/or completely gone. Lastly, patients who sought emergency care in the month after the encounter reported that their provider engaged in significantly fewer CS-SRM-related behaviours than did patients who did not seek emergency care.

Together, these results suggest that a fairly simple CS-SRM-based intervention administered by medical providers during the encounter may be *effective* for attaining better patient adherence and outcomes in the primary care setting. Furthermore, nearly 50% of patients reported that their provider engaged in at least 5 of the 7 CS-SRM-related behaviours; this indicates that a CS-SRM-based intervention may also be *feasible* for use in the time-limited encounter. The sizes of the effects of CS-SRM-related behaviours on patient adherence and outcomes were quite small, although they were in the realm of effect sizes between predictor and outcome variables in the social sciences (Rosnow & Rosenthal, 2003). There are many causes of non-adherence, many of which may not be readily addressed by providers during the encounter, some of which may not be suitable for CS-SRM-based approach. The practical benefit of a CS-SRM-based intervention in primary care should be thoroughly assessed in future research.

The aim of the current study was also to compare the effectiveness of the providers' CS-SRM-related behaviours to their interpersonal skills for attaining patient adherence and problem resolution. While these behaviours may ideally work in conjunction with each other, as posited by Ley's cognitive hypothesis model of compliance (1988), the time limitations of the primary care encounter likely require prioritization between the two types of behaviours (Kinmonth *et al.*, 1998). The comparison of the theoretical mechanisms in the current study resulted in support of our hypothesis that the

providers' CS-SRM-related behaviours would be more important for predicting patient adherence and problem resolution 1 month after the encounter than would be the providers' interpersonal skills, as reported by the patient directly after the encounter. The interpersonal skills of the provider were weakly related to patient adherence and problem resolution despite their strong relationship to patient satisfaction. There was also no significant difference in the mean number of patient-reported interpersonal skills of the providers between patients who sought emergency care in the month following the encounter and patients who did not. Prioritization of interpersonal skills, if they could be tailored to address patients' emotional representations (e.g., their emotional reactions to diagnosis) may be more important in settings other than primary care – such as in settings where initial cancer diagnoses are made.

Patient satisfaction was negatively associated with problem resolution and not significantly associated with patient adherence. These results further suggest that patient satisfaction is not an appropriate intermediate outcome to patient adherence and health outcomes. Similar results have been found in a review of patient-centreed empirical studies; the authors found that provider communication that got the patient to be more active in his/her illness management was more effective in gaining positive change in health outcomes than provider communication that merely elicited the patients' beliefs – which merely functioned to increase patient satisfaction (Michie, Miles, & Weinman, 2003). The CS-SRM-related behaviours investigated in the current study possibly functioned to increase patient activation in their own management by giving the information and expectations required to do so. The results do not seem to support Ley's cognitive hypothesis model of compliance, which states that patient satisfaction with the consultation is required for patient compliance/adherence; however, the measure of satisfaction was not specific to patient experiences enough to allow a proper assessment of the model. As discussed further below, a more comprehensive and specific measure of patient satisfaction that measures patient satisfaction with various elements of the consultation (amount of information given vs. the emotional support of the provider) would better allow such an assessment. The current results suggest that satisfaction with information given may be important for patient adherence and outcomes even if satisfaction with the provider (liking of the provider; satisfaction with emotional support) is not.

It is possible that addressing certain domains of a patient's CS-SRM may be more effective than addressing other domains when promoting adherence to a prescribed treatment. However, the *post hoc* analysis of the individual provider CS-SRM-behaviours did not indicate this to be true in the current sample. Perhaps, if providers engaged in the individual behaviours equally, which they did not do according to patient reports (Table 1), differential prediction of the outcomes would manifest themselves in the results.

The current study has some limitations. All measures were patient self-reports, which may be subject to social desirability bias and poor patient recall (King & Bruner, 2000). However, patient-reported adherence has been shown to be reasonably reliable and valid as a measure of actual patient adherence, being even more reliable and valid than some more objective measures (Haynes *et al*., 1980). Furthermore, we decided to assess the providers' CS-SRM-related behaviours and interpersonal skills via patient report for both practical and theoretical reasons: first, patient reports are more time and cost economical than coding audio recordings (and audio recordings are more invasive of patients' privacy). Second, it is far simpler for patients to respond to a questionnaire regarding a single interaction than for medical providers to reflect and

respond to questions on their behaviours in multiple interactions during the ongoing time pressure of their practice. Third, to lessen the probability of social desirability bias effect on the measure, the items were designed to ask the patient only about the provider's overt and observable CS-SRM-related behaviours and not to ask about the patients' evaluations of the provider's abilities or qualities. Lastly, relying on patient reports of provider behaviour affords us one other important advantage: patient reports are more likely to be related to the patient's subsequent behaviour than are observer-rated reports.

It is possible that the relationships among variables in the current study were confounded by patient-related factors that had nothing to do with the providers' actual behaviours or characteristics (Franks *et al*., 2006). However, the promise for an effective and feasible intervention using CS-SRM-related behaviours rather than interpersonal skills of the provider from the current results is strong enough to warrant an intervention design to test the theory. In an intervention, providers' actual behaviours would be altered, allowing for a test of the interventions' effectiveness without potential patient self-report confounds.

Some of the measures used in the current study are single-item measures, which were chosen for simplicity and for practical reasons. Use of single-item measures has both pros and cons, as covered in the literature: the reliability of a measure may be compromised by single-item measures, but more information can be gathered in a time-limited encounter using single-item measures of constructs. Bergkvist and Rossiter (2007) showed that for 'concrete concepts' (such as the level of understanding of an illness), single items are sufficient, whereas multi-item measures may be preferable when measuring 'broad concepts' (such as personality traits). Furthermore, Drolet and Morrison (2001) demonstrated that asking additional items for one concept contributes small increments of information, while potentially increasing participant irritation. Despite the practicality of single-item measures, well-designed measures for patient satisfaction (which one might argue is a 'broad' rather than a 'concrete' concept) that ask patients about their specific experiences rather than their overall satisfaction have been developed (Salisbury, Wallace, & Montgomery, 2010) and should be used in future research to replicate or build upon the current results or to better test Ley's cognitive hypothesis model of compliance.

Since the current study was not an intervention, the providers were not coached in any way nor were patients randomized to groups. The design allowed us to assess whether an intervention designed on the same items that were assessed in the current study could be feasibly and effectively implemented in the time-limited medical encounter; such an assessment before engaging in a fully randomized and controlled intervention is ideal for optimising use of providers', patients', and researchers' time. A randomized, controlled intervention can now be tested in primary care based off of the CS-SRM-related behaviours assessed in the current study. Such an intervention would assign providers to use a CS-SRM-based approach, a standard care approach, or a interpersonal skills-based approach, randomizing patients to condition/approach and then measuring patient adherence and outcomes to assess the validity/effectiveness and feasibility of each approach.

Q5

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