

Cognitive adaptation and mental health: A motivational analysis

CATHERINE F. RATELLE^{1*}, ROBERT
J. VALLERAND², YVES CHANTAL³ AND
PIERRE PROVENCHER²

¹*Université Laval, Canada*

²*Université du Québec à Montréal, Canada*

³*Université de Limoges, France*

Abstract

The present study tested a motivational model where the beneficial impact that processes of cognitive adaptation have on mental health takes place through self-determined motivation. The model proposes that the components of cognitive adaptation theory (positive self-perceptions, perceptions of control, and optimism) foster a self-determined motivation. In turn, self-determined motivation predicts positive indices of mental health. In addition, the model posits that the beneficial role of cognitive adaptation on mental health is mediated by motivational processes. The model was tested using a 1-year prospective design with a random sample from the general population. Results from structural equation modelling analysis provided empirical support for the proposed model. Results are discussed with regards to Taylor's (1983) cognitive adaptation theory, self-determination theory (Deci & Ryan, 1991), and the Hierarchical Model of Intrinsic and Extrinsic Motivation (Vallerand, 1997). Copyright © 2004 John Wiley & Sons, Ltd.

When individuals are victims of a chronic illness, one could expect that such an event would challenge their world assumptions that they are invulnerable, that everything has a meaning, and that they are good people. Realizing that these basic assumptions have been shattered could lead one to experience negative mental health such as feeling depressed, anxious, or worthless. This common conception has been challenged by research in the victimization literature, which suggests that individuals undergoing such an event positively distort their self-relevant perceptions, which in turn allows them to successfully adapt to their condition (Taylor, 1983).

Although research has documented the positive impact of cognitive adaptation on mental health (Taylor & Brown, 1988), very little is known on the nature of the psychological processes through which it operates. In this article, we present a motivational model of cognitive adaptation in which we

*Correspondence to: Dr C. F. Ratelle, Faculté des sciences de l'éducation, local 946, Université Laval, Québec (Québec), G1K 7P4 Canada. E-mail: catherine.ratelle@fse.ulaval.ca

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propose that self-determined motivation is the psychological mechanism through which cognitive adaptation enhances mental health.

DEFINING COGNITIVE ADAPTATION

Cognitive adaptation was first proposed as a process occurring after a threatening event such as a chronic illness. According to cognitive adaptation theory (CAT; Taylor, 1983), successful adaptation to victimization is accomplished through engagement in a series of mildly positive self-relevant cognitive distortions. That is, the adjustment process in response to a threatening event involves: (1) a search for meaning where the individual tries to achieve or maintain an optimistic attitude towards the event or towards life in general, (2) an attempt to regain mastery over the event or over one's life in general, and (3) a restoration of self-esteem. Subsequently, Taylor and Brown (Brown, 1991; Taylor & Brown, 1988), reframed these cognitive distortions in terms of 'positive illusions' and further suggested that optimism, perceived control, and positive self-perceptions promote well-being. Whether these components of CAT are illusions or not is beyond the scope of our paper. Rather, we argue that these components provide a motivational strength to the individual, which promotes mental and even physical health (Taylor, Kemeny, Reed, Bower, & Gruenwald, 2000). We believe that cognitive adaptation can occur not only when there's a highly threatening event but also in everyday life. The focus of this paper will thus be on 'normal', healthy individuals that are not undergoing a major threatening event such as a chronic illness. In line with Taylor and Brown (1988), we maintain that optimism, perceived control, and positive self-perceptions can have beneficial effects for the individual. We now turn to the examination of each component of CAT.

Regarding the first component of CAT, it seems that individuals do not perceive themselves objectively, with both positive and negative attributes. Instead, they typically evaluate themselves in a positive way. More specifically, researchers have found that 'normal' individuals estimate possessing far more positive qualities than negative ones (Brown, 1986; Brown & Gallagher, 1992; Dunning, Meyerowitz, & Holzberg, 1989; Kleinke & Miller, 1998) as well as possessing more positive qualities than other individuals (Alicke, 1985; Biernat, Vescio, & Green, 1996; Brown, 1986; Brown & Gallagher, 1992; Dunning et al., 1989; for a review on positive self-knowledge, see Brown & Dutton, 1995). Furthermore, individuals have a better memory for their positive attributes than for their negative ones (Kuiper & Derry, 1982; Kuiper & MacDonald, 1982; Kuiper, Olinger, MacDonald, & Shaw, 1985). Research on the egocentric bias has also demonstrated that individuals selectively attribute success feedback to themselves and failure to sources outside the self such that their self-esteem is maintained at a high level (Grove, Hanrahan, & McInman, 1991; Taylor & Riess, 1989; Tetlock & Levi, 1982; Vallerand & Richer, 1988).

The second component of CAT implies individuals' belief that they have the ability to control their environment. Numerous research findings have documented this tendency for individuals to perceive mastery over uncontrollable events. For example, individuals put in a gambling situation often behave as if they exerted control over the outcomes of the game, which is clearly a product of chance (Langer, 1975). Furthermore, they will exaggerate their responsibility if the obtained results are in the desired direction (Langer, 1975; Miller & Ross, 1975). Alloy and Abramson (1979) conducted a study in which normal nondepressed participants were assigned to a random task on which they had control 50% of the time. Nevertheless, results indicated that they estimated controlling the task 70% of the time. Results provided by depressed individuals and individuals in which a negative mood was induced revealed that they could accurately identify their level of control over the task (Alloy & Abramson, 1979; Alloy, Abramson, & Viscusi, 1981). It thus appears that perceived control is characteristic of the normal, healthy population.

The third component of CAT proposes that individuals hold an optimistic outlook on life. Indeed, research indicates that individuals believe that their present situation is better than their past and that their future will be rosier than the present even if this optimism is not warranted by their current situation (Brickman, Coates, & Janoff-Bulman, 1978). For example, individuals estimate having more chances than their peers to experience a range of positive events such as liking their first job, getting a good salary, or having a gifted child (Weinstein, 1980). In a similar vein, 'normal' individuals perceive having significantly less chances of being a victim of misfortune relative to their peers (Kuiper & MacDonald, 1982; Kuiper, MacDonald, & Derry, 1983; Perloff & Fetzer, 1986; Robertson, 1977; Weinstein, 1980, 1982).

COGNITIVE ADAPTATION PROCESSES AND MENTAL HEALTH

Results obtained in studies discussed above suggest that having a positive view of oneself, perceptions of control, and optimism is characteristic of the normal population, thereby suggesting a positive association between cognitive adaptation processes and mental health. Evidence for the mental health promoting aspects of cognitive adaptation is provided by studies with depressed individuals. Indeed, results substantiate a negative association between such mild cognitive distortions and depression. More specifically, as compared to nondepressed individuals, depressed individuals do not show perceptions of control, report more accurate estimations of their positive and negative qualities, display greater concordance with observers' ratings of their personal attributes, and do not demonstrate optimism toward their future (see Alloy & Abramson, 1988; Brown, 1991; Taylor, 1989). Components of CAT, in addition to being negatively associated with depression, tend to correlate negatively with neuroticism (Brown, 1991). Results also indicate that individuals in denial (Lazarus, 1983) or those who resist self-deception report lower levels of depression and neurosis (Sackeim, 1983). It thus appears that cognitive adaptation processes are associated with indices of mental health.

Moreover, elements of CAT are associated with other positive variables such as higher motivation, greater persistence, and performance (see Taylor & Brown, 1988). Studies on self-efficacy (Bandura, 1977), a concept akin to perceived control, show that individuals perceiving a personal sense of efficacy report being more motivated and display increased effort. Research on achievement indicates that individuals holding these mild cognitive distortions perform better than individuals approaching tasks with realism (Bandura & Schunk, 1981; Dweck & Leggett, 1988). Furthermore, individuals confident in their abilities to successfully perform an activity will direct more attention towards the task whereas those who are less confident in their abilities will display more task-irrelevant cognitions (Sarason, 1975). Likewise, having positive self-views and believing in one's abilities are associated with hard work and persistence on more difficult tasks, as well as with the use of efficient strategies (Bandura, 1989), especially after individuals experience failure (Felson, 1984). As a consequence, individuals will perform better (for a review see Brown, 1991). In sum, cognitive adaptation processes tend to be associated with enhanced motivation and performance.

Furthermore, components of CAT are also positively correlated with indices of social popularity (both actual and perceived) as well as with happiness and contentment (Bohrstedt & Felson, 1983; Felson, 1981). Individuals that report being happier are those who tend to perceive themselves more positively, have a tendency to believe that they exert control on uncontrollable events in their lives, and are more likely to be optimistic regarding their future (see Taylor & Brown, 1988). In addition, optimism has also positive effects on coping and mood (Brown, 1993; Kleinke & Miller, 1998; Segerstrom, Taylor, Kemeny, & Fahey, 1998).

In sum, results from numerous studies suggest that cognitive adaptation in the normal and physically healthy population generally produces positive effects on mental health. However, the psychological processes through which these effects occur have not yet been studied. Below, we present a model that explains how these effects may take place.

A MOTIVATIONAL MODEL OF COGNITIVE ADAPTATION

The motivational model of cognitive adaptation proposes that the beneficial contribution of cognitive processes on mental health operates by fostering self-determined motivation (see Figure 1). First, processes of cognitive adaptation (positive self-perceptions, perceived control, and optimism) will promote a self-determined motivation (behaving out of choice and pleasure rather than external pressure or lack of purpose; see Deci & Ryan, 1985; Vallerand, 1997). More specifically, individuals who think of themselves in highly positive terms, who believe to have control over events in their lives, and who are optimistic toward their future will tend to be motivated in a more self-determined fashion. Several research findings support this hypothesis. Indeed, previous studies have found that positive perceptions of oneself are positive predictors of dimensions like competence, motivation, persistence,

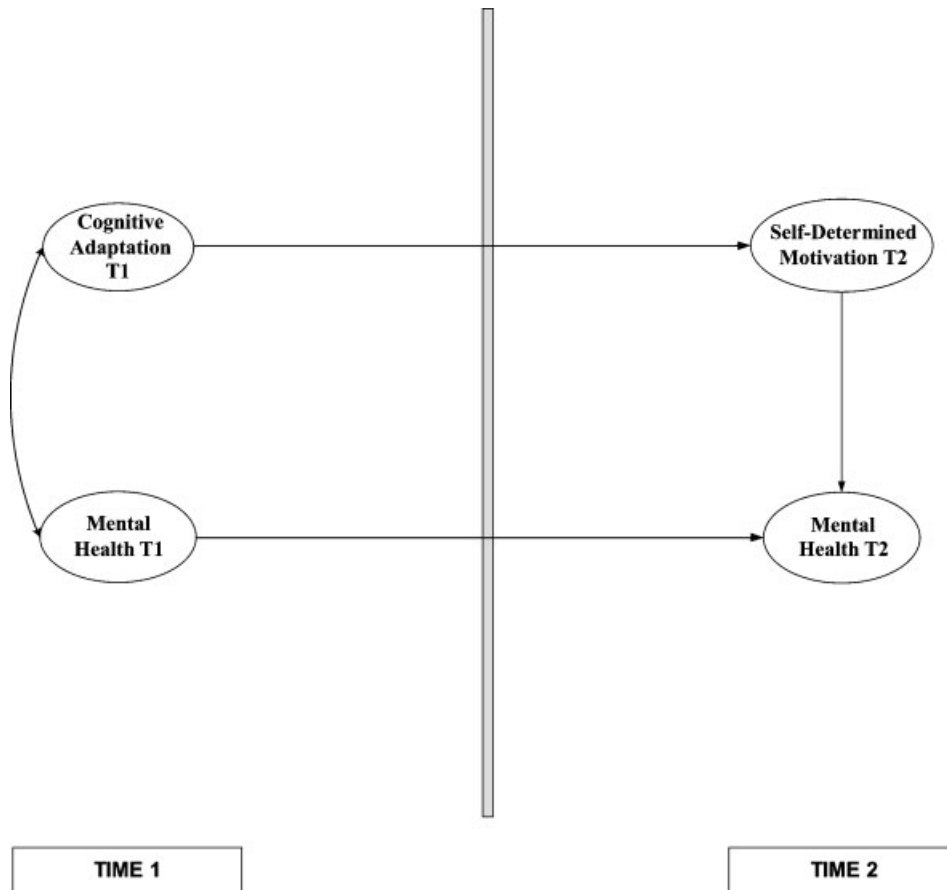


Figure 1. The motivational model of cognitive adaptation—the prospective theoretical model

performance level, and effort (Bandura, 1977; Felson, 1984; Tran & Cole, 2000). In sum, components of CAT appear to foster a more self-determined motivation.

Second, the model predicts that having a more self-determined motivation leads individuals to be mentally healthier. This hypothesis is supported by several research findings, which reveal that the most positive consequences are derived from the most self-determined types of motivation such as intrinsic motivation (i.e. behaving out of pleasure and satisfaction) and identified regulation (i.e. behaving out of personal choice). Alternatively, the most negative consequences are usually produced by the least self-determined forms of motivation like external regulation (where behaviour is guided by reward attainment or punishment avoidance) and amotivation (i.e. absence of motivation). Such results have been obtained on a series of variables related to mental health such as life satisfaction, positive emotions, creativity, feelings of hope in life, vitality, and the absence of suicidal ideation (for a review, see Deci & Ryan, 1985; Ryan, 1995; Vallerand, 1997). More importantly, these findings have been obtained in several life contexts such as interpersonal relationships (Blais, Sabourin, Boucher, & Vallerand, 1990), sports (Brière, Vallerand, Blais, & Pelletier, 1995), leisure activities (Losier, Bourque, & Vallerand, 1993; Pelletier, Vallerand, Green-Demers, Brière, & Blais, 1995), work (Blais, Brière, Lachance, & Vallerand, 1993), and education (Ryan & Connell, 1989; Vallerand et al., 1993; Vallerand & Bissonnette, 1992; Vallerand, Blais, Brière, & Pelletier, 1989; Vallerand, Fortier, & Guay, 1997). Furthermore, this pattern of results has also been obtained with different age groups, such as elderly populations, using different mental health indicators such as self-reports of self-esteem, meaning of life, life satisfaction, absence of depression, as well as positive levels of psychological functioning and involvement, as measured by health professionals (Losier et al., 1993; O'Connor & Vallerand, 1990, 1994; Vallerand & O'Connor, 1989, 1991; Vallerand, O'Connor, & Hamel, 1995).

Importantly, the proposed model suggests that self-determined motivation operates as a mediator of the relationship from cognitive adaptation to mental health. Hence, once the contribution of motivational processes on mental health is considered, the direct effect of cognitive adaptation should be significantly reduced. The model also posits that cognitive adaptation processes do not obligatorily result from a negative event. For this reason, we should be able to find these mild cognitive distortions in normal individuals that are not afflicted with cancer, AIDS, or any other unfortunate conditions.

In sum, past research and theory support the relations in our motivational model of cognitive adaptation. However, it is important to note that no study to date has tested the different parts of the model within the confines of the same study. This represented the first goal of the study. A second purpose of the study was to test the model with a sample of the general population rather than with college students, as is typically the case in most social and health psychology studies. A third goal of this study involved the use of a prospective design in order to determine if variables of the model predict changes in mental health over time. Finally, the last purpose of this study was to examine if our model applies to both men and women as well as to individuals scoring low and high on social desirability. This allowed us to test the generalizability of the model for both men and women and determine if the model was influenced by social desirability concerns. It was hypothesized that the proposed model would be supported in all cases.

METHOD

Participants

The participants in this study were 420 adults (183 women and 241 men) of 18 to 55 years of age ($M = 36.4$ years) randomly selected from the general population of the Greater Montreal area. The

majority of participants spoke French as their first language (82%) and had an annual income superior to 20 000\$ CAN (59%). Of all the participants, 35% were single (i.e. currently not in a relationship), 53% were romantically involved (either married or cohabiting), and 12% were divorced. Over 60% of the sample had at least a high school diploma.

Procedure

Participants were initially contacted by telephone by a poll firm. A rigorous protocol guided the random choice of some 1000 names taken from the Montreal area phone book. The list of chosen names included an equal number of men and women. In order to participate in the study, individuals had to be between 18 and 55 years of age. They were inquired about their interest in participating in a study on beliefs toward various life situations. They understood that they would be asked to complete a questionnaire. Upon acceptance, the participants' names and addresses were recorded and the questionnaire was mailed. Because of the personal nature of the questions on mental health, the mailing of questionnaires was favoured over telephone interviews. Upon refusal, another person of the same sex was chosen according to the procedures mentioned above. In addition, 2 weeks after the first call, another telephone call was made. If the participant did not return the questionnaire after this second call, another person of the same sex was randomly chosen from the telephone book. The whole set of procedures increased our confidence in obtaining a sample that would be as representative as possible of the adult French-Canadian population of the Greater Montreal area.

A total of 3142 telephone calls were made to eligible participants (women and men aged between 18 and 55, not retired) from the Greater Montreal area. Of this number, 1900 individuals agreed to receive and complete a questionnaire. To facilitate response rate, participants were told that a lottery draw of three prizes, worth 500\$ in total, would take place. Of the 1900 mailed questionnaires, 959 were returned for a response rate of 50.5%. Exactly 12 months after receiving the first questionnaire, a second one was mailed to participants. Of these questionnaires, 84 were returned because the participants had moved to an unknown new location. Of the remaining 875 questionnaires assumed to have reached destination, a total of 450 questionnaires were returned yielding a 51.4% response rate. From these questionnaires, 26 were rejected because of missing data. Thus, a total of 420 questionnaires were included in the statistical analyses. Analyses revealed that participants who returned only the first questionnaire did not significantly differ from those who returned both questionnaires on the variables included in the model at Time 1.

Measures

The first questionnaire that was mailed to participants included three scales measuring cognitive adaptation processes, mental health, and social desirability. They are described below. Descriptive statistics for all scales of the study are presented in Table 1.

Cognitive Adaptation

The World Assumptions Scale by Janoff-Bulman (1989) was used to measure positive self-perceptions and perceived control. This scale includes eight dimensions of which two were chosen. These three-item subscales measure positive self-perceptions (e.g. 'I am very satisfied with the kind of person I am.'; $\alpha = 0.80$) and perceived control (e.g. 'I usually behave in ways that are likely to maximize good

Table 1. Means, standard deviations, and Cronbach alphas for scales

	<i>M</i>	<i>SD</i>	Alpha
1. Cognitive adaptation (T1)			
Optimism ^a	4.89	1.20	0.72
Positive self-views ^a	5.60	1.14	0.80
Perceptions of control ^a	4.35	1.17	0.75
2. Self-determined motivation ^b	9.91	3.86	0.87
3. Mental health (T1)			
Depression ^c	1.32	0.55	0.79
Anxiety ^c	2.05	0.77	0.78
4. Mental health (T2)			
Depression ^c	1.32	0.56	0.82
Anxiety ^c	2.08	0.82	0.81

Note 1: *M* = mean; *SD* = standard deviation.

Note 2: *n* = 424.

Note 3: ^a = this scale ranges from 1 to 7; ^b = this scale ranges from -18 to 18; ^c = this scale ranges from 1 to 4.

results for me.'; $\alpha = 0.75$). In line with Aspinwall and Taylor (1992), we assessed optimism with three items from the Life Orientation Test (LOT-R; Scheier, Carver, & Bridges, 1994; e.g. 'Overall, I expect more good things to happen to me than bad.'; $\alpha = 0.72$). A Cognitive Adaptation Index (CAI) was computed where each construct represents a dimension of cognitive adaptation (see Helgeson, 1999). Satisfying indices of reliability and validity for these scales have been obtained in past research (see Janoff-Bulman, 1989; Scheier et al., 1994). In the present study, a Cronbach alpha of 0.87 was obtained for the CAI.

Mental Health

Two subscales of the General Health Questionnaire (GHQ; Goldberg & Hillier, 1979) were used to measure mental health. These were the depression and anxiety subscales (both recoded toward the positive). For the sake of brevity, only four of the seven items were used for each subscale. Numerous studies have established the validity and the reliability of the GHQ (e.g. Goldberg & Hillier, 1979; Goldberg, Cooper, Eastwood, Kedward, & Shepherd, 1970). For the present study, acceptable Cronbach alphas were obtained for both anxiety ($\alpha = 0.78$) and depression ($\alpha = 0.79$) subscales.

Social Desirability

Participants also completed a shortened version of the Social Desirability Scale (SDS; Crowne & Marlow, 1960). This version includes 14 items. The SDS has previously been found to possess adequate psychometric characteristics. A Cronbach alpha of 0.67 was obtained in the present study.

The questionnaire that participants received at Time 2 included the scale assessing mental health at Time 1 as well as a scale assessing global self-determined motivation. Satisfactory Cronbach alphas were obtained for mental health indicators (anxiety, $\alpha = 0.81$; depression, $\alpha = 0.81$).

Global Self-determined Motivation

A shortened version of the Global Motivation Scale (GMS; F. Guay, M. R. Blais, R. J. Vallerand, & L. G. Pelletier, unpublished data; see Guay, Mageau, & Vallerand, 2003 for more information of the

GMS) was included in the questionnaire. This 16-item version assesses self-determined (i.e. intrinsic motivation and identified regulation) and non-self-determined (i.e. external regulation and amotivation) forms of motivation. The four-factor structure of the GMS was supported and it has been shown to display high levels of reliability and validity (see Guay et al., 2003; Vallerand, 1997).

The present study made use of the self-determination index (SDI) to assess self-determined motivation. The different types of motivation represent specific levels of self-determination and can be ordered along a continuum ranging from high (for intrinsic motivation) to low (for amotivation) self-determination. In order to create an index where the amount of self-determination for each motivational type is taken into account, a different weight was allocated to each subscale, according to the technique used and reported by several authors (e.g. Grolnick & Ryan, 1987; Vallerand & Bissonnette, 1992; also see Vallerand, 1997 on this topic). Thus, a weight of +2 was awarded to the intrinsic motivation subscale since this construct represents the highest level of self-determination. A weight of +1 was assigned to the identified regulation subscale. A weight of -1 was allocated to the external regulation subscale because it represents a negatively self-determined motivation. Finally, a weight of -2 was awarded to the amotivation subscale since this construct represents the lowest level of self-determination. Multiplying the scores for each subscale by its corresponding weight and adding all the products yields an index for the individuals' global self-determined motivation. This same score was used to perform the statistical analyses reported below. In the present study, a Cronbach alpha of 0.87 was obtained for the SDI.

Most of the scales described above were answered on a 7-point Likert scale except for the GHQ, which utilizes a 4-point scale, and for the SDS, which uses 'True' or 'False' type of answers. Finally, participants completed demographic questions (i.e. age, gender, marital status, education level, occupation, income, etc.).

Statistical Analyses

Models were analysed by structural equation modelling with EQS (Version 5.6; Bentler, 1993), under Maximum Likelihood (ML) estimation. To determine the fit of the model, we considered different indices of fit. First is the generalized likelihood ratio, which, in large samples, is interpreted as a Pearson chi-square (χ^2) statistic. This fit index is similar to the least square criterion of regression. Using this statistic can have its limits such as the fact that there is no upper bound and that it is affected by sample size. However, a solution for reducing the impact of large sample size is to divide the χ^2 value by its degrees of freedom (χ^2/df), resulting in a lower value. Although there is no clear guideline as to the value of this ratio, a value less than 3 is preferred (see Kline, 1998). Second, incremental fit indices will be measured (Bentler-Bonett *Non-Normed Fit Index*, NNFI; and the Bentler *Comparative Fit Index*, CFI; Bentler, 1990; Bentler & Bonett, 1980). This family of indices examines the amount of improvement in the model fit in comparison to the null model. While CFI is less affected by sample size than NNFI (also known as the Tucker-Lewis Index), the latter corrects for model complexity. Possible values range from 0 to 1, although values for NNFI can fall outside of this range. However, it is suggested that values above 0.90 reflect an acceptable fit (Schumacker & Lomax, 1996). Lastly, we will examine the *Root Mean Squared Error of Approximation* (RMSEA), a Jöreskog-Sörbom index (Jöreskog & Sörbom, 1996) that represents a summary of covariance residuals (i.e. the differences between observed and postulated covariances). A perfect model fit corresponds to a RMSEA of 0 while a value of 0.05 approximates an acceptable fit and values close to 0.08 indicate reasonable errors of approximation (Browne & Cudeck, 1993; also see Jöreskog & Sörbom, 1993). When reporting values of RMSEA, it can be quite informative to also indicate confidence intervals for this score, which indicate the range of RMSEA values for the model.

RESULTS

Measurement Models

Before the whole structural model could be tested, measurement models were estimated. This procedure increases our confidence in the validity of the later structural model because it reduces measurement error. Two measurement models were tested. First, a CFA model was tested for all the variables included at Time 1. Second, another CFA model was tested for the variables included at Time 2. Thus, two different measurement models were examined. Results from the analyses are presented below.

Indices of Self-determined Motivation

In order to test SEM models, we computed four indices of self-determined motivation. These indices offer the possibility to integrate scores on each motivation subscale under a single score, thus reducing the number of variables in the tested models. These indices are depicted in Figures 2 and 3 under labels MOT1, MOT2, MOT3, and MOT4. Following the procedure commonly used in the self-determination theory (SDT) literature (e.g. Blais et al., 1990; Fortier, Vallerand, & Guay, 1995; Grolnick & Ryan, 1987; Vallerand et al., 1997), subscale items were used to compute these indices by subtracting non-self-determined forms of motivations from self-determined forms motivations. These motivational

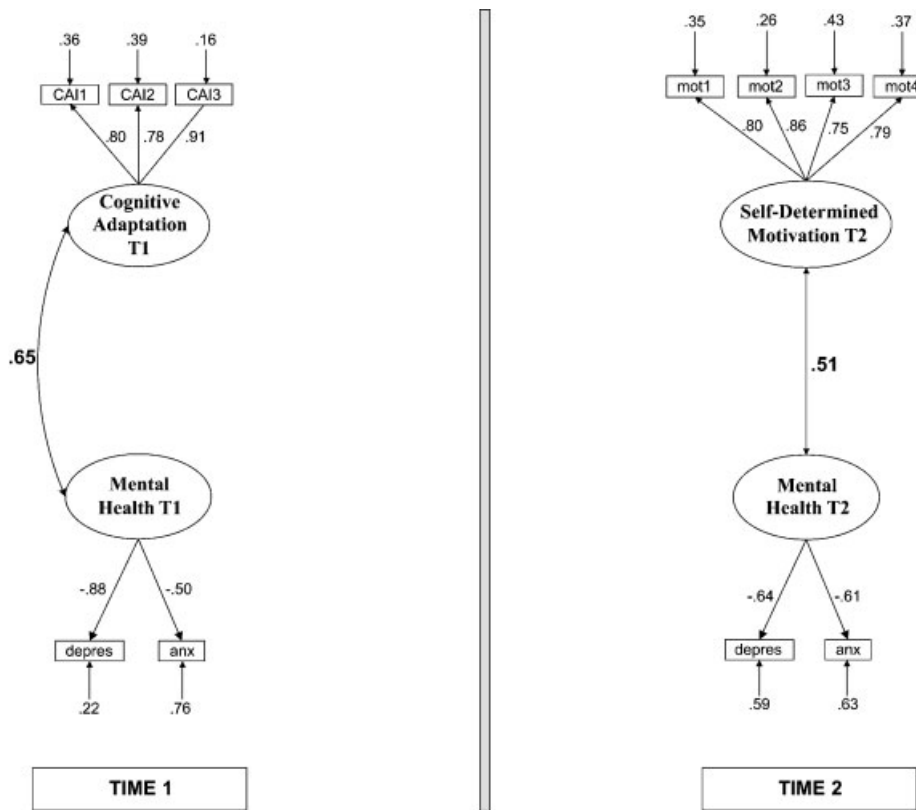


Figure 2. Measurement models for Time 1 variables (left) and Time 2 variables (right)

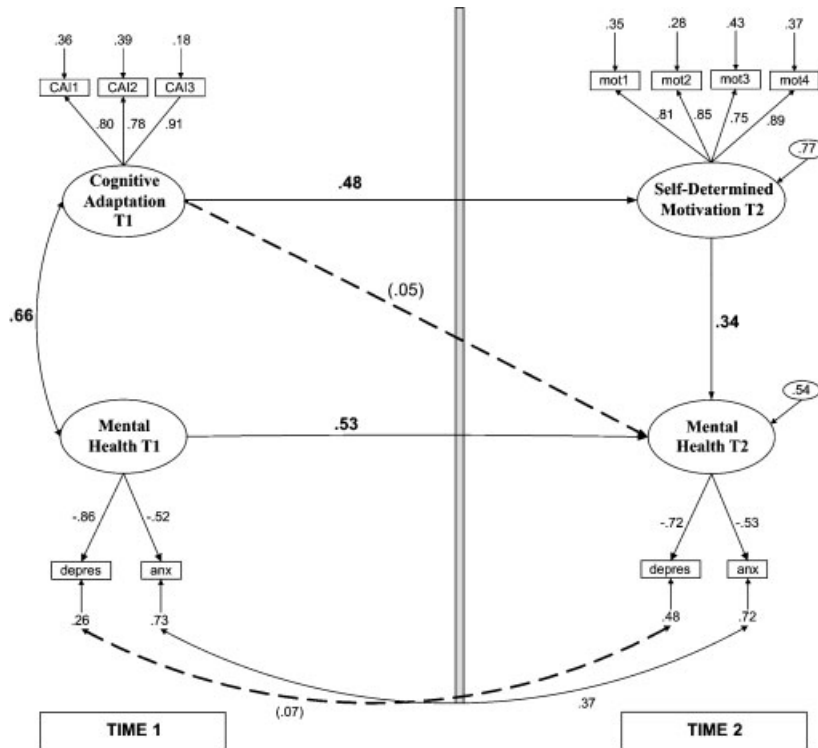


Figure 3. The motivational model of cognitive adaptation—obtained results

indices thus represent individuals' relative levels of self-determination with higher scores indicating higher levels of intrinsic and identified regulation relative to external regulation and amotivation. We used the formula presented in the *Measure* section: $(2 * \text{intrinsic motivation}) + (1 * \text{identified regulation}) - (1 * \text{external regulation}) - (2 * \text{amotivation})$. We computed the first index (i.e. see label MOT1 in Figures 2 and 3) by taking the first item of the four GMS subscales. To compute the three remaining indices (MOT2, MOT3, and MOT4), we used respectively the second, third and fourth item of each subscale. There were four items per subscale and thus four self-determination indices were computed for the GMS. For the structural equation modelling analyses, all indicators were centred to forego multicollinearity problems (Kline, 1998).

Testing a Measurement Model for Time 1 Variables

First, we tested the measurement model for the variables measured at Time 1 (see left panel of Figure 2). It was composed of two latent factors: the CAI and mental health. One factor loading was fixed to 1.0 for each factor in order to scale them. The χ^2 for this proposed measurement model had a value of 0.89 ($df = 4$) and was not statistically significant ($p = 0.93$). The χ^2/df ratio was below 3 (0.22). The fit of the model was found to be high (NNFI = 1.0; CFI = 1.0; RMSEA = 0.00, CI = 0.00, 0.02).¹ The CFA

¹The fact that fit indices were high was not a statistical artefact due to the identification status of the model. For this model, as well as for the other two (CFA with T2 variables and the hybrid model), the number of observations exceeded the number of parameters to be estimated.

model for T1 variables was found to be supported by empirical evidence. Thus, the latent factors representing the CAI and mental health were adequately measured by their respective indicators. All covariances and all factor loadings were found to be statistically significant ($p < 0.01$).

Testing a Measurement Model for Time 2 Variables

The following step involved testing the measurement model for the variables measured at Time 2 (see right panel of Figure 2). It was composed of two latent factors: the SDI and mental health. Again, one factor loading was fixed to 1.0 for each factor in order to scale them. The χ^2 for this proposed measurement model had a value of 8.85 ($df = 8$) and was not statistically significant ($p = 0.35$). The χ^2/df ratio was below 3 (1.11) and indices of fit for the model were high (NNFI = 1.0, CFI = 1.0, RMSEA = 0.02). The CFA model was empirically supported by the data. Thus, the latent factors representing the SDI and mental health were adequately measured by their respective indicators. The covariance and all factor loadings were found to be statistically significant ($p < 0.01$).

Testing of a Hybrid Model

The structural aspect of the proposed model was tested by means of a hybrid model, which incorporated both structural and measurement components (Kline, 1998). Correlations and standard deviations for variables of the model can be found in Table 2. In line with CFA models previously tested, the proposed hybrid model is composed of four latent factors. The model included two exogenous variables (the CAI and mental health at Time 1) and 2 endogenous variables (the SDI and mental health at Time 2). Covariances were freed between T1 and T2 measures of mental health. According to Marsh and Yeung (1998) it is important to appropriately control for method/halo effects associated with measures collected on multiple occasions. Because the failure to control for these effects produces positively biased estimates of stability, they argued that tested models should always contain correlated uniqueness (i.e. correlation between measurement errors of the same indicator through time). Here we find a significant covariance with respect to anxiety (0.36) but not depression (0.07, *ns*). As it was the case for the CFA model, latent factors were scaled by fixing one of their factor loadings to 1.0.

The obtained χ^2 had a value of 36.95 ($df = 37$) and it was not found to be statistically significant ($p = 0.47$). The χ^2/df ratio was acceptable (1.00). Fit indices were found to be high (NNFI = 1.00; CFI = 1.00; RMSEA = 0.00, CI = 0.00, 0.03). The solution for the proposed hybrid model is depicted in Figure 3. The results indicate that the CAI at Time 1 was positively associated with the SDI

Table 2. Correlations and means and standard deviations for the model variables

Measures	1	2	3	4	
1. Cognitive adaptation T1 ^a		0.46	0.40	0.30	
2. Mental health T1 ^c			0.24	0.48	
3. Self-determined motivation T2 ^b				0.35	
4. Mental health T2 ^c					
	<i>M</i>	4.95	1.68	9.91	1.70
	<i>SD</i>	0.87	0.56	3.86	0.58

Note 1: all $ps < 0.001$.

Note 2: $n = 424$.

Note 3: ^a = this scale ranges from 1 to 7; ^b = this scale ranges from -18 to 18; ^c = this scale ranges from 1 to 4.

($\beta = 0.48$). In turn, the SDI positively predicted mental health ($\beta = 0.34$), over and beyond the contribution of mental health at Time 1 ($\beta = 0.53$). The direct contribution of CAI at Time 1 on mental health at T2 was not significant ($\beta = 0.05$, *ns*), suggesting that the contribution of cognitive adaptation on indices of mental health is completely mediated by motivational processes. All other path coefficients and covariances were found to be statistically significant ($p < 0.01$). Hence, empirical support for the motivational model of cognitive adaptation and mental health was provided by our data.

Alternative Models

Although our model was theoretically driven, some might argue that other, alternative models might fit the data best. Although such models are merely statistically-not theoretically-driven, we nevertheless tested for such possibilities. We tested several possibilities and, among models that were tested, none were found to yield superior estimations of the relations uniting the variables of this study. For example, a model was tested whereby the CAI at Time 1 predicted increases in mental health at Time 2 (hence controlling for the stability in mental health from Time 1 to Time 2). In turn, enhanced mental health fostered self-determined motivation. Another example is a model where the CAI at Time 1 predicted a positive mental health at Time 1, which in turn enhanced self-determined motivation. Self-determined motivation was positively associated with increases in mental health. In sum, several other statistical models were tested, none of which were found to be superior to the theoretical model proposed by the literature.

Also, additional analyses were conducted to ensure that the model applied equally to men and women, as well as to individuals scoring high and low on social desirability. Because of the large number of parameters to be estimated, we did not have enough participants to perform multigroup analyses. Instead, path analyses were done with regression analyses separately for men and women, as well as for individuals displaying low and high levels of social desirability. Results revealed that the four additional models were considerably similar, with all path coefficients being significant. We also performed regression analyses using social desirability as a predictor for each variable, along with its predictor (e.g. self-determination was regressed on the CAI and on social desirability). Results revealed that social desirability only predicts T2 anxiety ($\beta = -0.16$, $p < 0.05$; R^2 change = 0.02, $p < 0.05$).² Overall, these findings reveal that the motivational model of cognitive adaptation and mental health revealed no gender differences. Further, the links of the model were not affected by social desirability except for Time 2 anxiety. Considering the fact that the present findings were obtained with a sample of the general population, while using a prospective design, it would appear that they are rather robust.

In sum, the motivational model of cognitive adaptation was empirically supported, suggesting that the beneficial role of cognitive adaptation on mental health is mediated by self-determined motivational. We now turn to the implications of our findings.

DISCUSSION

The purpose of the present study was to test, with a random sample from the general population, a motivational model of cognitive adaptation where the beneficial role of optimism, positive

²The other paths always remained significant even when the social desirability path was significant.

self-perceptions, and perceived control on mental health is mediated by self-determined motivation. Specifically, processes of cognitive adaptation predicted a self-determined motivation. In turn, self-determined motivation predicted changes of mental health in time (controlling for initial level of mental health). The direct effect of cognitive adaptation on mental health was not significant, supporting the mediating role of motivation. Thus, results of this model suggest that the beneficial role of cognitive adaptation can be explained by the motivational force that is engendered by these positive processes. Finally, the appropriateness of the model was tested with individuals from the general population displaying different levels of social desirability and with individuals from both genders.

The present findings underscore at least two important points. First, the predictive dimension of the motivational model of cognitive adaptation and mental health was corroborated. Indeed, it was possible to predict participants' mental health on a 12-month basis using the model's variables. Despite stability in mental health from Time 1 to Time 2, motivational processes were able to significantly predict changes in mental health. Second, cognitive adaptation processes were found to be associated with a more self-determined motivation, which in turn was related to a more positive mental health. Moreover, once the contribution of motivation on mental health was considered, cognitive adaptation was found to be negligible, highlighting the fact that its beneficial effect is mediated by motivation. The present results thus provide strong support for the motivational model of cognitive adaptation and mental health.

The present results have important implications for CAT (Taylor, 1983, 1989; Taylor & Armor, 1996; Taylor & Brown, 1988). First, they provide support for Taylor's proposition that cognitive adaptation is beneficial to mental health. The present results revealed that cognitive adaptation was positively associated with mental health (i.e. low anxiety and depression). Second, these results validated, with individuals from the general population, the findings that cognitive adaptation is associated with mental health, thereby supplementing the results typically obtained with college students (Aspinwall & Taylor, 1992) and with AIDS or cancer patients (Taylor et al., 1992). Third, these results add to Taylor's position by specifying the psychological processes underlying the beneficial effect of cognitive adaptation on mental health. The present results suggest that cognitive adaptation exert its effect through self-determined motivation. However, other variables can explain the beneficial role of cognitive adaptation on mental health. For example, in line with work by Fredrickson (e.g. Fredrickson & Joiner, 2002), it is possible that cognitive adaptation benefits mental health through the positive affect it generates. Another potential contributor could be social support where individual who hold positive views of themselves, feel in control of their life, and are optimistic elicit supportive behaviour from their social environment, which leads them to better adjust to life events and be more mentally healthy. Fourth, these findings add to Taylor's position by showing that cognitive adaptation is not only triggered by events (such as chronic illness). They also seem to contribute to 'colouring' the perceptions of everyday events for individuals from the general population. Finally, the present results provide support for Taylor's position while using a prospective design. Although Aspinwall and Taylor (1992) also used a prospective design to predict mental health from cognitive adaptation components (optimism, self-esteem, and locus for control), their sample was composed exclusively of college students. The fact that the present findings were obtained prospectively with a sample from the general population provides additional weight to Taylor's theory of cognitive adaptation.

The present results also have implications for SDT (Deci & Ryan, 1991). SDT postulates that the most positive consequences are derived from self-determined motivation. In concordance with earlier findings (Vallerand et al., 1995; Vallerand & O'Connor, 1989), the present study has shown that individuals motivated in a self-determined way were those reporting a more positive mental health. Moreover, this empirical support is provided by a sample of individuals from the general population.

The present results also provide support for the Hierarchical Model of Intrinsic and Extrinsic Motivation (Vallerand, 1997). This model proposes that mental health is influenced directly by motivation at the global (personality) level. Altogether, these results provide empirical support for several theoretical perspectives on cognitive adaptation and motivation, in addition to providing a better understanding of the mechanisms underlying the link between cognitive adaptation and mental health.

In closing, we must mention some shortcomings inherent to the study. A first limitation concerns the sample used in the study. Participants included in the study were 18 to 55 years of age. Notwithstanding that this constitutes a large portion of the population age range, we still did not include all age ranges of the general population. Also, it must be noted that the sample included mainly French-Canadian individuals from the Greater Montreal area. Further research should determine if the present results generalize to individuals from other linguistic backgrounds and from different age groups. A second limitation concerns the correlational nature of the present findings. Because an experimental design was not used, it cannot be asserted that cognitive adaptation 'caused' an increase in mental health. A third limitation concerns the fact that, of the 3142 telephone calls that were initially placed, 420 participants were finally used in the final statistics. This represents only 13% of the total number of people contacted. Because the percentage is low, obtained results might only characterize this sample and, thus, may not generalize to the rest of the population. A fourth limitation concerns the potential role of a third variable like neuroticism or affect in explaining the relationships among variables of our model. Future research should include such measures in an attempt to rule out their potential role. A fifth limit concerns our use of self-report measures, which entails a possible self-presentation bias in participants' answering. Future research should replicate our findings using other types of measures (e.g. implicit measures, self-others agreement, etc.). Lastly, it is important to remember that the present study only assessed a limited number of mental health indicators (i.e. anxiety and depression, recoded). Future research should test the generality of the present results using other mental health indicators.

In conclusion, the findings from this study underscore the fundamental role that cognitive adaptation processes plays in the mental health of the general population. More importantly, the present study highlights the mediating role of self-determined motivation in the relation from cognitive adaptation to mental health. Specifically, components of CAT (optimism, positive self-perceptions, and perceived control) were associated with a self-determined motivation. In turn, self-determined motivation predicted changes in mental health after 1 year. The direct impact of cognitive adaptation on mental health was nonsignificant once motivation was taken into account, suggesting that it acted as a mediator in this relation. Future research is needed, however, in order to further test the generality of the motivational model of cognitive adaptation and mental health.

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