

The Mediating Role of Depression Between Early Maladaptive Schema and Pain: A Structural Equation Modelling

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Abstract

Background: Individuals with chronic pain frequently display comorbid depression. Depression and chronic pain may be related to childhood maltreatment and early distress. Early maladaptive schemas (EMSs) designed to assess early distress. EMSs are at the core of personality pathology and psychological distress.

Objective: The main objective of this study was to test the hypothesis that depression mediates the relationship between EMSs and pain.

Methods: One hundred chronic pain patients completed Young's Schema Questionnaire, McGill Pain Questionnaire and depression subscale of Hospital Anxiety and Depression Scale.

Results: We estimated two structural models; second model fitted the clinical sample well ($\chi^2 = 19.2$; $p = .31$). In this model a latent variable (general maladaptive schema) was explored is directly associated with depression ($\beta = 0.39$; $p < 0.01$); Also depression is associated with the pain ($\beta = -.57$; $p < 0.01$); General maladaptive schema had an indirect effect on pain that was mediated by depression ($\beta = -.35$; $p < 0.01$).

Conclusions: The results of the study suggested that early emotional maltreatment plays an important role in depression and pain in chronic pain patients. The model can help to adequate and establish targets for the psychological treatments included in multidisciplinary programs for this disorder.

1. Background

Chronic pain is a serious health complex issue. Like any long-term health problem, the condition often leads to complications beyond physical symptoms, such as psychological disorder (1, 2). The bio-psycho-social model of illness highlights the importance of biological, psychological and environmental contributions to the etiology and treatment of all illness (3). Although there is a large amount of evidence pointing to the biological factors associated with chronic pain, there is a growing body of evidence of psychological and social factors affecting the course and outcome of pain(4,5).

Pain and physical deterioration is often related with changes in mood (6, 7). Depression is a common comorbidity in chronic pain (8), in chronic pain patients, the prevalence of depression ranges from 3% to 10%(1).

Some studies suggest that pain leads to depression (9, 10, 11), while others propose that depression leads to pain (6, 12). In patients with pain, depression is associated with greater pain intensity, longer duration of pain and more pain complaints (13). The causality connection of depression and pain has been a focus of many studies and the question still seems to lack a definitive answer (14).

Both depression and chronic pain have been shown to produce disability, which is a major cause of inability for work and early retirement (15). Physical symptoms are reported related to childhood maltreatment (16). Also Depression is often claimed to be a mediator between pain and childhood

trauma (17, 18). Childhood sexual, physical and emotional abuse and psychological and social adversities of childhood have been shown in numerous studies to be associated with somatic complaints and chronic pain in adulthood (19, 20, 21, 22) and also with depressiveness (23, 24, 25, 26, 27). Abusive or neglectful childhood experiences are reported to be associated with an increased danger of experiencing chronic pain in adulthood (28). The association of chronic pain and emotional maltreatment alone has been less studied.

Young's schema-focused therapy is based on negative core beliefs or early maladaptive schemas (EMSs) which refer to dysfunctional cognitive frameworks for viewing the self and others that develop primarily in response to adverse childhood events and are subsequently elaborated throughout an individual's life. More specifically, EMSs develop when universal psychological core needs (e.g., autonomy, support, understanding, secure attachment and freedom to express valid needs and emotions) are not met. EMSs act on the deepest level of cognition, usually outside of awareness, and make the individual psychologically vulnerable to develop depression, anxiety, psychosomatic disorders such as chronic pain and dysfunctional relationships (29).

Young, Klosko, and Weishaar(30) recognized 18 EMSs that persons can develop and maintain. These 18 EMSs can be categorized into five different domains. Schema domains include disconnection and rejection, impaired autonomy and performance, impaired limits, other directedness and over vigilance-inhibition. Each domain represents one important part of the core needs of the child. Many EMSs like mistrust/abuse, abandonment/instability or emotional deprivation reflect purely early emotional maltreatment, such as abandonment and neglect. Researches of both clinical and university samples have provided evidence that EMSs in all five domains are associated with higher current levels of depressive symptoms(31,32,33,34). Most notably, there is substantial evidence that dysfunctional attitudes, which are another form of cognitive vulnerability (35, 36, 37) and interpersonal vulnerability factors(38, 39) predict depressive symptoms when activated by stressful life events. Zautra et al.(40) found consistent evidence that a history of depression increases risk of pain among rheumatoid patients. Also they found current depressive symptoms were also associated with greater pain in rheumatoid arthritis patients. Saariaho , Saariaho , Karila , and Joukamaa(41) showed that from a total of 271 chronic pain patients 158 scored one or more early maladaptive schema as meaningful. The patients with meaningful EMSs had significantly higher pain intensity.

Despite the association between chronic pain, early maladaptive schema factor and depression and their similar risk factors in childhood, the quality of the association between them is not definite. These EMSs show extensively underlying psychic patterns and serve as a good opportunity to find covert processes and psychic shapes.

2. Objective

With regard to considering the important role of EMSs in pain and depression in chronic pain patients and lack of research in this area, the purpose of this study is 1) to examine the presence of early maladaptive

schemas in chronic pain patient sample and 2) to ascertain how pain, early maladaptive schema factors and depressiveness are related together in the chronic pain patient and 3) to test bio-psycho-social model of pain within a chronic pain patient sample.

We purpose that early maladaptive schema factors predict depressiveness (42, 43, 44, 45, 46) and that pain is the end state(46).

3. Methods

3.1. *Participants and procedures*

A cross-sectional study was used to examine the association between pain, depression and early maladaptive schema and to identify predictors of pain in chronic pain patients. The protocol of the study was approved by the "Regional bioethics committee". According to accepted statistic criteria a sample size between 100 and 200 subjects is considered adequate for studies involving parsimonious models to be estimated by structural equations (47). The sample composed of 100 patients with chronic pain. These patients were recruited from an outpatient chronic pain clinic affiliated with Lorestan University of Medical Sciences. Of the initial sample of 115 patients, 15 (13.04%) were excluded because of incomplete data. The final sample consisted of 100 patients, including 72 (72%) females with a mean age of 45.46 ± 12.67 years and 28 (28%) males with a mean age of 40.68 ± 13.99 years. The mean length of total education was 13.07 ± 2.72 years (range 9–18 years). The mean length of duration of pain in total sample was 5.67 ± 5.74 years. Men and women did not differ in age, duration of pain and education.

Inclusion criteria were: 1) receiving the diagnosis of chronic pain by a neurologist and spine specialist 2) age 18-70 years old 3) being able to write and read 4) willingness to participate in the study. Patients were excluded if: 1) had dementia and mental retardation 2) were unable to write and read or were not agree to be participated in study.

The procedure was as follow: First patients were visited by a neurologist and spine specialist and the diagnosis based on experimental criteria was established. Then for those who fulfilled the inclusion criteria, the aim and the process of the study along with confidentiality of the gathered information were described. If the patient agreed to continue and was orally consent to participate in the study, then they were asked to complete 4 questionnaires including socio-demographic data form, depression subscale of Hospital Anxiety and Depression Scale (HADS), third edition of Young's Schema Questionnaire(YSQ-SF3) and McGill Pain Questionnaire (MPQ).

3.2. *Measures*

3.2.1. *Young Schema Questionnaire—Short Form 3(YSQ-SF3)* Based on the framework of schema therapy, the Young Schema Questionnaire (YSQ-SF3) was developed by Young, Klosko, and Weishaar(30). The original scale has 18 subscales grouped into 5 schema domains as follows: disconnection and rejection (schemas of emotional deprivation, abandonment, mistrust/abuse, social

isolation, and defectiveness), impaired autonomy and performance (schemas of failure, dependence, vulnerability, and enmeshment/ undeveloped self), impaired limits (schemas of entitlement and insufficient self-control), other directedness (schemas of subjugation, approval-seeking, and self-sacrifice) and Over-vigilance and inhibition (schemas of emotional inhibition, unrelenting standards, negativity/pessimism, and punitiveness). The questionnaire consists of 90 self-report items that are rated on a six-point Likert-type scale (1 = entirely untrue of me, 6 = describes me perfectly). As each subscale consists of five items, the score obtained on the subscales varies between 5 and 30.

Soygüt , Karaosmanoglu , and Cakir (48) has shown good levels of validity and Reliability. The reliability and validity of the YSQ-SF extended in Iranian language has been (49). In our study the Cronbach's alpha coefficients for the YSQ-SF3 subscales range between .74 and .90.

3.2.2. Hospital Anxiety and Depression Scale (HADS) HADS is a self-report scale which was developed for detecting symptoms of anxiety and depression in non-psychiatric patients from a medical outpatient unit. It contains two seven-item subscales: one for depression and one for anxiety, with a score ranging from 0 to 21. Every item has a choice of 4 fixed response statements (weighted 0-3). A score of 8 to 10 points indicates borderline significance for either scale, but less than 8 points is insignificant. A cut-off score of 7 was used because investigations have shown that this is optimal for detecting psychiatric morbidity(50). The reliability and validity of the HADS to detect mood disorders has been recognized (51). In general the Iranian version of the HADS can be considered reliable and valid. Cronbach's alpha coefficient (to test reliability) has been found to be 0.86 for the HADS depression sub-scale and 0.78 for the HADS anxiety sub-scale (52). In the present study, the Cronbach's alpha coefficient for the HADS depression sub- scale was 0.84.

3.2.3. McGill Pain Questionnaire (MPQ) is a self-reporting measure of pain used for patients with a number of diagnoses. It assesses both quality and intensity of pain patients. The MPQ is composed of 78 words, of which respondents choose those that best describe their experience of pain. 7 words are selected from the following categories: dimension 1 to 10 (pain Sensory), three words; dimensions 11 to 15 (pain affective), dimension 16 (pain Evaluative) one word, and dimension 17 to 20 (pain miscellaneous) one word. Scores are formulated by summing values associated with each word; scores range from 0 (no pain) to 78 (severe pain). Qualitative differences in pain may be reflected in respondent's word choice (53).

3.3 Statistical Analysis

Structural equation modelling (SME) were conducted using AMOS-18. These models permit to include variables that are correlated with, and can be used to predict other variables. Parameter estimates, including factor loadings, indirect and total associations, and path coefficients for direct, and residual error variance terms for criterion variables, were examined for statistical significance. The following criteria were used as indexes of acceptable model fit: 1. - the likelihood-ratio chi-square statistic ($X^2/df < 3$); 2. - Goodness of Fit (GFI) >0.90 ; 3. - Adjusted Goodness of Fit Index (AGFI) >0.90 ; 4. - Root Mean Square Error of Approximation (RMSEA) $<.05$; 5. - Comparative Fit Index (CFI) >0.90 (47).

Analysis process started with a model defined from theoretical approach (Figure 1). This model is adopted from the stories of chronic pain patients. The basic structure of this model is similar to the study by Saariaho et al., (41). A SEM of latent variable was developed with depressiveness as a mediator between latent variable and pain. SEM required selection of beginning and endpoints in the cyclical model and pain was designed as the endpoint for the model. As shown in Fig. 1, the latent construct General Maladaptive Schema (GMS) was specified by five schema domains: disconnection and rejection, impaired autonomy and performance, impaired limits, other-directedness, over vigilance and inhibition. Amos software path analysis was conducted to test the model which showed the direct and indirect effects of GMS on pain with the mediation of depressiveness.

4. Results

Means, standard deviations, and scale reliabilities (Cronbach's Alpha) for the SQ-SF, pain and depression subscale of HADS are shown in Table1. In all cases these alpha levels were well above 0.70 and showed good internal consistencies. The average depression score indicate moderate depressive symptoms. In total chronic pain patients the scores for Self-Sacrifice (20.15 ± 5.95), Emotional Deprivation (19.59 ± 7.3) and Unrelenting Standards/ Hyper criticalness (19.11 ± 5.58) EMSs showed the highest occurrence in that order of magnitude.

In women the scores for self-sacrifice (20.005 ± 6.41) and emotional deprivation (19.9 ± 7.42) EMSs and in men unrelenting standards/hyper criticalness (21.172 ± 5.64) EMSs showed the highest rate in that order of magnitude. The t-tests revealed a significant difference between females and males in EMSs. Significant mean differences for gender were obtained for the entitlement/ grandiosity score, $t(98) = -3.558$, $p = 0.001$, $CI\ 95\% = -6.373, -1.809$, approval seeking, $t(98) = -2.063$, $p = .042$, $CI\ 95\% = -5.890, -1.140$ and unrelenting standards, $t(98) = -2.349$, $p = .021$, $CI\ 95\% = -9.568, -1.517$. No significant differences were found between females and males in total pain and depression mean scores. The correlations among the measures included in the data analysis are displayed in Table 2. Correlations between the various schemas domains and depression were significant and ranged from 0.42 to 0.72.

Table 1 Means, standard deviations, and scale reliabilities for the SQ-SF, Pain and Depression

	M	SD	Cronbach's <i>alpha</i>
Schema Domains and EMSs			
Emotional Deprivation	19.59	7.3	0.84
Abandonment	18.51	7.1	0.9
Mistrust	14.01	6.29	0.87
Social Isolation	16.14	6.67	0.89
Defectiveness	15	6.7	0.84
Failure	17.81	6.88	0.89
Dependence	14.49	6.1	0.84
Vulnerability	16.73	6.76	0.86
Enmeshment	14.55	5.45	0.74
Subjugation	16.02	5.92	0.88
Self- Sacrifice	20.15	5.95	0.86
Approval Seeking	18.54	6.64	0.88
Emotional Inhibition	18.45	6.81	0.85
Negativity Pessimism	16.98	6.79	0.9
Unrelenting Standards	19.11	5.58	0.83
Punitiveness	18.14	5.35	0.78
Entitlement	18.9	5.45	0.78
Insufficient Self control	16.75	5.53	0.81
Disconnection and Rejection	83.25	28.24	0.88
Impaired Autonomy and Performance	63.6	20.8	0.84
Impaired Limits	34.84	9.4	0.87
Other Directedness	54.72	14.91	0.8
Over vigilance and Inhibition	72.69	19.54	0.8
Chronic pain			
Total Pain	41.97	8.12	0.83
Pain Sensory	27.79	5.2	0.798
Pain Affective	4.73	2.3	0.71

Pain Evaluative	3.35	1.14	0.88
Pain Miscellaneous	6.12	3.4	0.86
Depression	12.94	5.39	0.84

Table2. Correlations among the Variables Included in the Data Analysis

Measure	1	2	3	4	5	6	7
1.Depression	—						
2.Pain	-0.577*	—					
3.Disconnection and Rejection	0.716*	-0.437*	—				
4.Impaired-Autonomy and performance	0.689*	-0.236**	0.837*	—			
5.Impaired Limits	0.418*	-0.225**	0.631*	0.613*	—		
6.Other Directedness	0.569*	-0.29**	0.781*	0.76*	0.704*	—	
7.Over vigilance and Inhibition	0.618*	-0.316**	0.779*	0.765*	0.675*	0.786*	—

*p <.005: **p < .001

4.1. Measurement model test

Results of the first path analysis (see Fig.1) showed that while the overall model was statistical fit, X^2 (df=13,n=100)=18.99,p=.22, GFI=.94, AGFI=.91, CFI=.98, NFI=.95, TLI=.97, RMSEA=.03, CMIN/DF=1.46, the regression weight for GMS in the prediction of pain is not significantly different from zero (β = -0.05; p=.65); the other parameters were adequate (p<0.05). Hence, the path analysis was trimmed by removing the non-significant path. Results of this alternative model are depicted in Fig. 2. Results of this path analysis indicated a non-significant result thus providing evidence of good model fit, X^2 (df= 14, n=100) =19.2, p=.31, Other fit indices supported the X^2 goodness of fit statistic (GFI=.94, AGFI= .91, CFI= .98, NFI=.95, TLI=.97, RMSEA=.026, CMIN/DF=1.37). The standardized regression coefficients for the relevant paths are shown in Fig.2, all of which them are significant.

As can be seen from Fig.2, GMS is directly associated with depression (β =0.39; p<0.01); explained variance for depression was 36%. Also depression is negative associated with the pain (β = -.57; p<0.01); and explain 32% of its variance. GMS had an indirect effect on pain that was mediated by depression (β = -.35; p<0.01). Table 3 contains both invariant and standardized structural model parameters for chronic pain patients from alternative model.

Table 3. Invariant and Standardized Parameter Estimates for alternative model

	Path		Unstandardized Path Coefficients	Standard Error	standardized Path Coefficients	P value
Depression	→	GMS	.54	.1	.60	<.001
Disconnection	→	GMS	3.98	.56	.85	<.001
Impaired Autonomy	→	GMS	2.85	.41	.83	<.001
Impaired Limits	→	GMS	.38	.05	.64	<.001
Other directedness	→	GMS	2.1	.29	.85	<.001
Overvigilance/ Inhibition	→	GMS	2.61	.038	.81	<.001
Pain	→	Depression	-2.5	.35	-.57	<.001

5. Discussion

Accumulating evidence indicates that individuals with chronic pain have more psychological compliance than other populations. The aim of this study was to investigate the relationship between EMSs, depression and pain in chronic pain patients.

Self- sacrifice was the highest mean scored schema in chronic pain patients. This finding is consistent with previous study (46) and emotional deprivation schema was second highest mean scored schema in chronic pain patients in this study. Self- sacrifice schema is a belief that one should focus on others' needs rather than one's own (30). Chronic pain patients with self-sacrifice schema had been work very long hours since childhood which had caused them to suffer pain and prevented them from recovering from pain and they hoped to be in less pain to return to the same work (46). They frequently assumed a caregiver's role and hid their pain. Finally they become pain-exhausted, because only the maximum pain is able to stop them.

Young, Klosko , and Weishaar (30) reported that the patient with self- sacrifice schema almost always has emotional deprivation schema. Emotional deprivation schema is the belief that one's primary

emotional needs will never be met by others. Emotional deprivation schema is a common schema in psychosomatic disorders such as chronic pain. The patients with emotional deprivation schema do not express their feelings. Therefore patients with limited emotional awareness and verbalization ability may describe the physiological aspects of emotions in somatic terms, such as pain severity.

The third highest mean scored schema in this study was unrelenting standards/hyper criticalness schema. People with this schema emphasize excessively on attaining very high internalized standards of behaviors or performances. They strive to reach these high standards to avoid criticism. Unrelenting standards/hyper criticalness schema provokes pain problem, as the pain patients were extremely careful and conscientious in their work and ignored their bodies' sensations or need for rehabilitation.

The findings showed that men compared to women had significantly higher mean scores in the entitlement/ grandiosity, approval seeking and unrelenting standards/hyper criticalness schemas. These schemas labeled were encumbered pattern (46). Chronic pain patient with these schemas is self-demanding, seeks approval almost resignedly. They strive frenetically for achievement, approval or perfection. These patients have overactive life-style. Such a life-style can be a predisposing, initiating and perpetuating factor for chronic pain and it strongly resembles the content of encumbered pattern (54,55, 56, 46).

In line with Young theory, the study found evidence that maladaptive schemas domains were significantly associated with depressive symptoms (30). Such results are consistent with a number of previous studies (23, 42, 57, 58, 59). The results showed that GMS predicted depressiveness and depressiveness predicted pain. Also GMS had direct effects on depressiveness but GMS had not direct effect on pain. GMS had an indirect effect on pain that was mediated by depressiveness. From the theoretical point of view the data support the view that early adversities such as childhood neglect, emotional abuse and early emotional maltreatment predispose chronic pain patients to depression. Childhood emotional maltreatment (i.e., neglect or verbal hostility) will be preferentially associated with negative schemas with themes of loss and worthlessness (e.g., Emotional Deprivation, Dependency, Social Isolation, Failure, Vulnerability, Subjugation, and Self-Sacrifice) that mediate high levels of anhedonic symptomatology (60).The data suggests a salient role of early emotional trauma in the progression of depression in chronic pain patients such as chronic pain. Therefore it can be concluded different EMSs mediate the relation between childhood adversity and later depression.

Also the results showed that depressiveness predicts pain symptoms. The estimate support antecedent theory (depression precedes pain) in the chronic pain patient (61) (Currie & Wang, 2005).This finding is consistent with Zautra et al. (40). The reason for this finding is that depressed patients have reduced pain perception thresholds and tolerances. Also another explanation for this finding, referring to the diathesis-stress model (62), is that chronic pain patients have psycho-social diathesis (early maladaptive schema factors) and the stress of chronic pain triggers the depression which in turn compounds disability (9, 63) and deficiency in the descending inhibitory system of pain (64,65).

According to the model, GMS could not directly predict pain. This finding is consistent with Saariaho et al., (41). They showed that pain intensity was not predicted by any of the schema factor. One explanation for this finding may be that the pain and schema factor are not parallel processes. Another reason for this finding could be that with increasing age among patients with chronic pain, some EMSs predicted pain disability and pain intensity, but since in our study the range of age varied, activated maladaptive schema of the subjects were different thus GMS could not predict pain. One limitation of the current study is the use of self-report questionnaires for the assessment of the EMSs, pain and depression, which may influence the accuracy of these reports. As an alternative to self-report questionnaires, future researches may use projective tests or physiological indicators of information processing in the evaluation of EMSs(65, 66) or a history of life approach as utilized by Abela, Auerbach, Sarin,& Lakdawalla(67). In addition, this study was cross-sectional and only prospective analyses will give an exhaustive picture of the causal relationships between EMSs, depression and pain.

6. Conclusions

The findings of the present study are indicative of a relationship between schema-level dysfunction, depression and pain. Prospective and experimental researches were required to further clarify the nature of this relationship so that more conclusive statements can be made regarding the potential causal and/or maintenance role of maladaptive schemata in triggering pain problems and depression. For instance, of benefit would be prospective research investigating whether a higher level of maladaptive schemata predicts more pain disability, pain severity and depression. Such study should address the potential role of general schema disturbance as well as specific schemata and investigate the multiple pathways through which schemata may have a negative impact on pain control behaviors. Ultimately, further study into the role of EMS in pain may provide a rationale for the implementation of schema-based interventions as a component in the treatment of chronic pain individuals.

Declarations

CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Figures

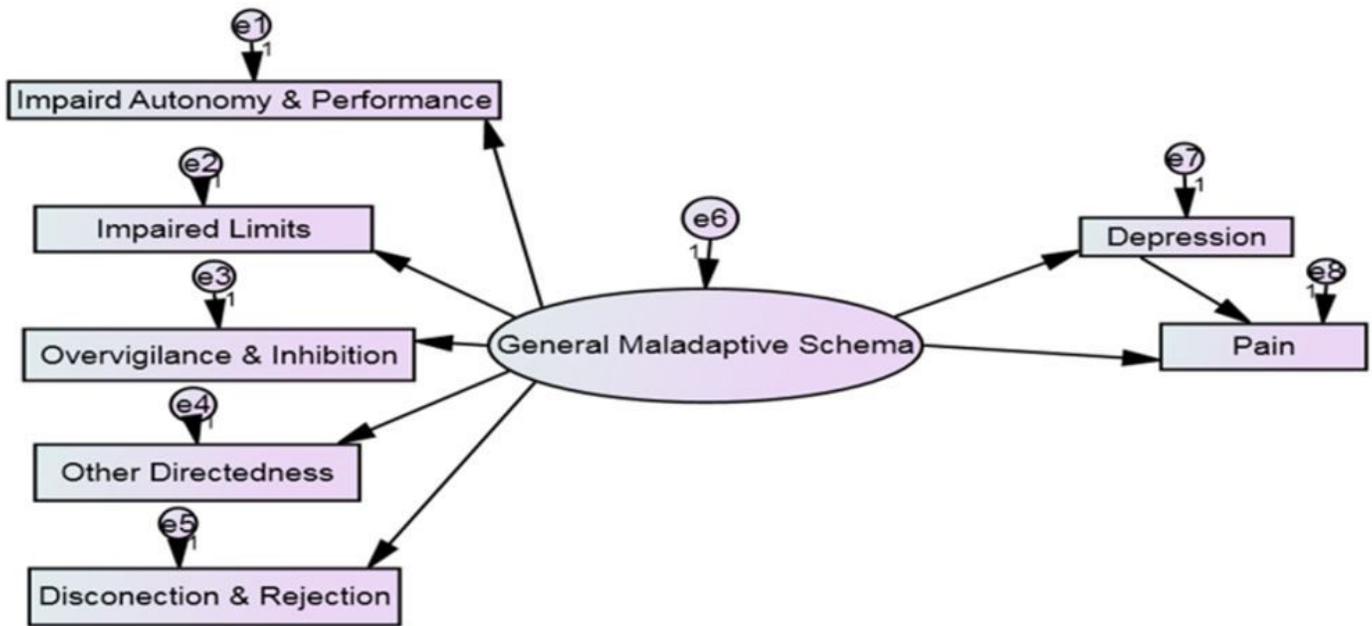


Figure 1

Assessed basal model: it shows GMS is linked to five main variables, whereas depression as a predictor of pain. Measurement errors associated with each observed variable are presented by "e"

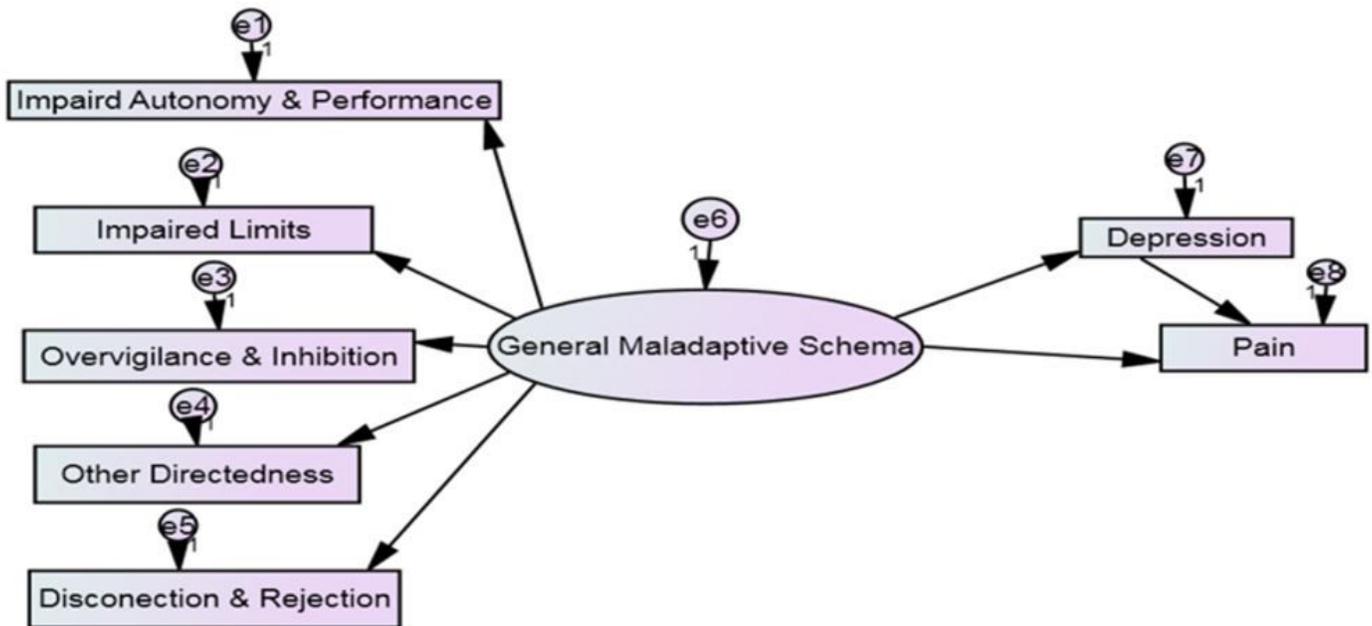


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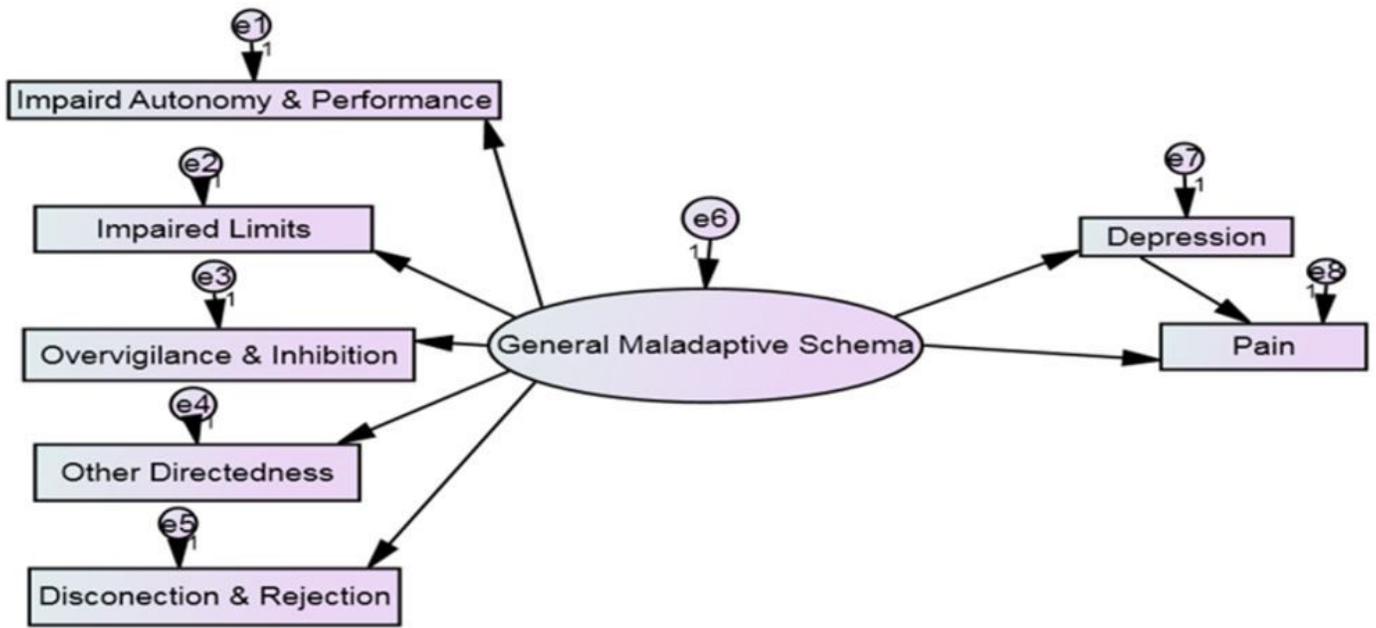


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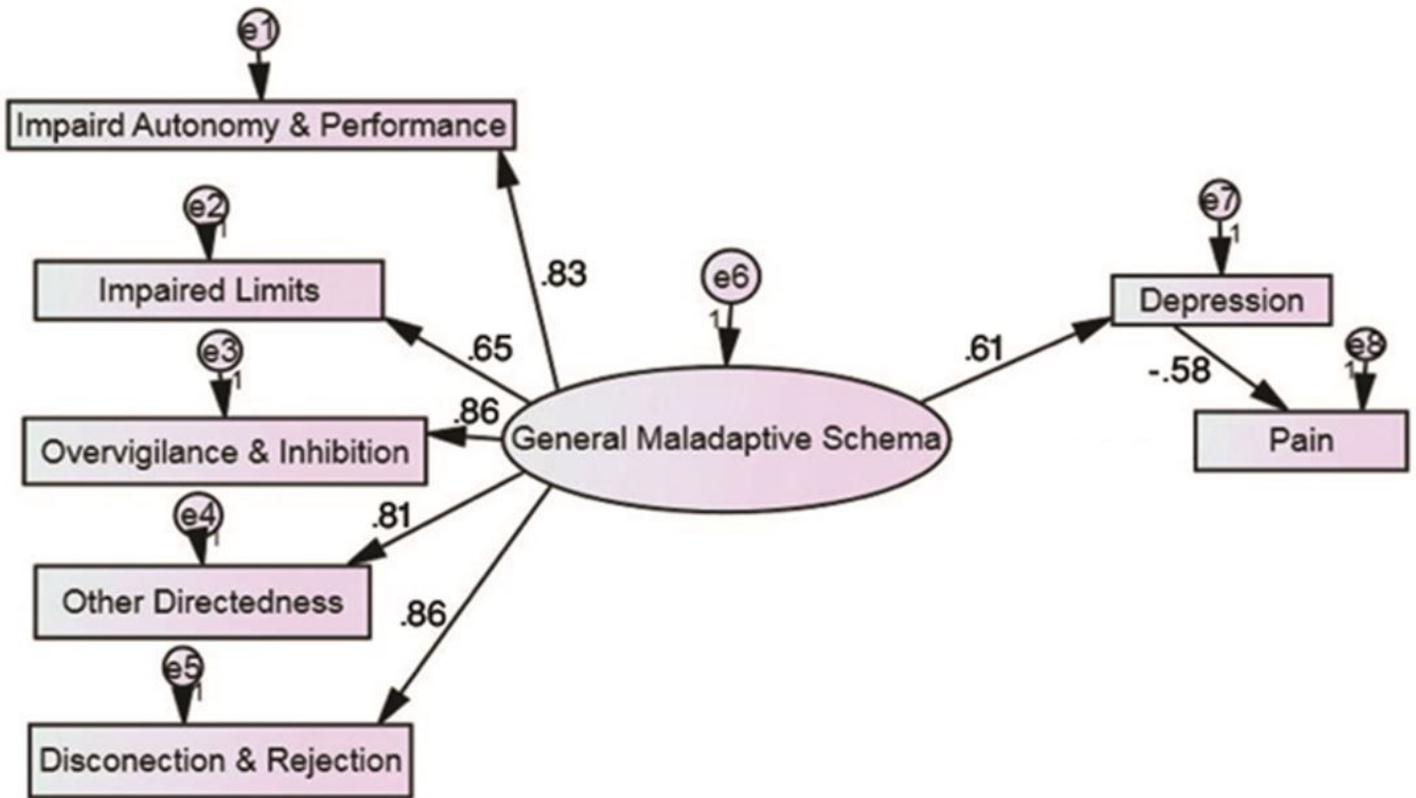


Figure 2

Final model assessed. GMS is explained by five schema domains; their positive relationship with GMS is shown in the model. GMS is positively associated with depression. GMS had an indirect effect on pain that was mediated by depression.

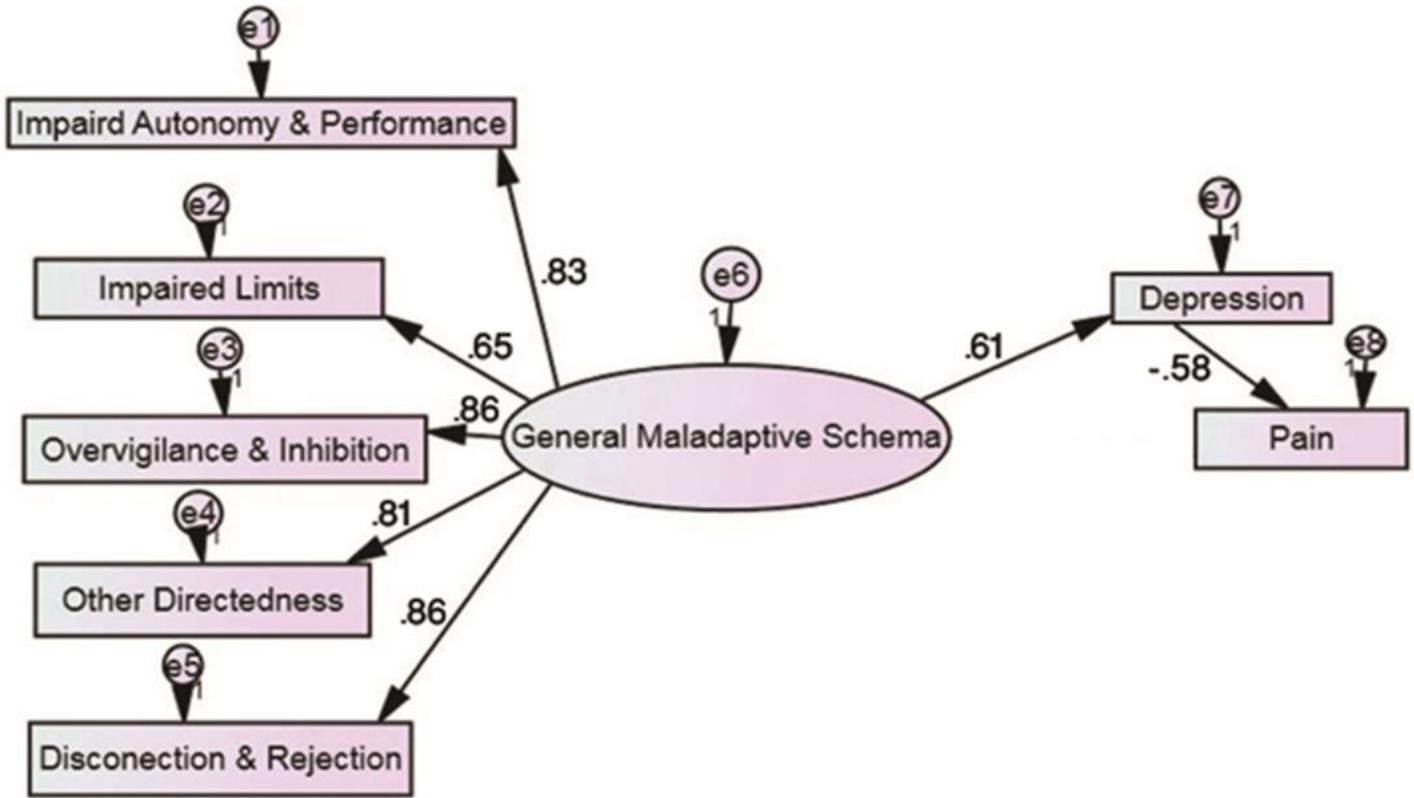


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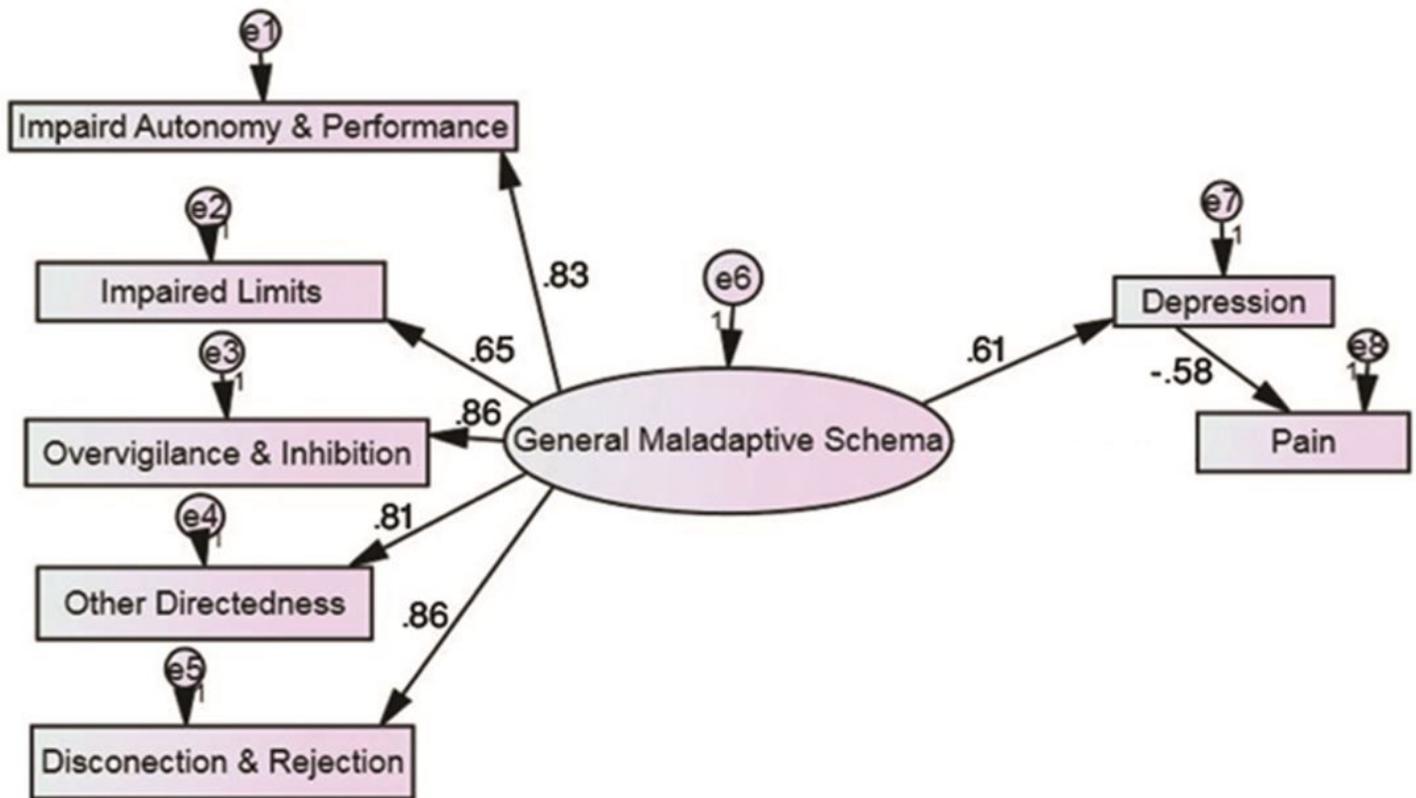


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