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# Impact of psychological characteristics on spinal cord stimulation outcome

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## Introduction

Reduced efficacy of spinal cord stimulation (SCS) may be attributed to technical factors, resulting in loss of target area paraesthesia and analgesic efficacy. It has been suggested that the impact of psychological factors should be taken into consideration when investigating SCS efficacy. A systematic review observed a lack of consistent evidence to suggest any particular psychological factors linked with SCS efficacy.<sup>1</sup> Depression was suggested by the majority of the studies included in this review as a possible impacting factor; however it was concluded that successful treatment could modify the level of depression if it was a state in reaction to the pain rather than a trait characteristic. The most common psychological factor associated with the onset and continuation of chronic pain is catastrophising, alongside a lack of perceived internal control. It can therefore be hypothesised that certain psychological factors, specifically coping strategies may interact with the experience of pain and response to SCS. The aim of this prospective study was to identify psychological characteristics that may impact on the efficacy of SCS.

## Methods

Seventy-five patients were initially recruited and 56 patients (31 female and 25 male) were followed-up for 12-months. Outcome measures were assessed at baseline, six-months and 12-months following SCS implantation included visual analogue scale (VAS), Oswestry disability index (ODI), hospital anxiety and depression (HAD) scale and the pain coping strategies questionnaire (PCSQ).

## Results

Statistically significant improvements were observed for the VAS ( $p < 0.001$ ), ODI ( $p = 0.011$ ), anxiety ( $p = 0.042$ ), and depression ( $p = 0.010$ ) in the HAD scale and for the subscales reinterpreting pain sensation ( $p = 0.018$ ), control over pain ( $p = 0.001$ ), and ability to decrease pain ( $p < 0.001$ ) of the PCSQ. We observed that depression and autonomous coping (control over pain, ability to reduce pain, and catastrophizing) may impact sensory aspects such as pain intensity (Table 1) and disability scores affecting the outcome of SCS treatment. Age at time of implant and duration of pain prior to implant were also found to impact SCS efficacy.

**Table 1.** Predictors of pain reduction

Stage	Predictor	Baseline predictors of pain at 12 months		
		Standardized Coefficients (Beta)	t	P
1	Gender	-0.054	0.421	0.676
	Age at time of implant	0.324	2.452	0.018
	Duration of pain prior to implant	-0.186	-1.409	0.165
2	Gender	0.023	0.184	0.855
	Age at time of implant	0.33	2.576	0.013 *
	Duration of pain prior to implant	-0.213	-1.618	0.112
	HAD anxiety	0.23	1.373	0.176
	HAD depression	-0.152	-0.83	0.411
	Cognitive and Behavioural Strategies Component	0.009	0.072	0.943
Autonomous Coping Component		0.329	2.206	0.032 *
Summary statistics		Model 1: R = 0.341, R <sup>2</sup> = 0.116, F(3,53) = 2.320, P = 0.086 Model 2: R = 0.498, R <sup>2</sup> = 0.248, F(7,49) = 2.310, P = 0.041 *		

$P < 0.05$

## Discussion

There is good support for psychological factors affecting pain from both clinical work and neuroimaging, and also for SCS affecting pain at higher centers, including the anterior cingulate cortex. It is therefore reasonable to hypothesize that the pain relief achieved and psychological outcome are linked. Our focus was on constitutional psychological factors and their impact upon outcome. We can only conjecture as to the possible mechanisms. A neurochemical basis could explain less responsiveness due to greater diffuse noxious inhibitory control.

## Conclusion

Psychological characteristics such as depression and autonomous coping strategies may influence and predict the long-term efficacy of SCS. Also age at time of implant and duration of pain prior to implant were found to impact SCS outcome. Support for patients with low autonomous coping strategies and long-standing depression prior to implant may prove efficacious to long-term SCS outcome.

### Reference

1. Sparkes E, Raphael JH, Duarte RV, et al. Pain 2010; 150: 284-289.

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