Determining Whether Pain Sensitivity Contributes to the Fear-Avoidance Model

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Aim

- To determine whether pain sensitivity, measured by Quantitative Sensory Testing (QST), has predictive value for pain-related outcomes of the Fear-Avoidance Model (FAM).

Methods

- Eighty participants with chronic musculoskeletal pain completed the following measures:
  1. Self-report questionnaires: Brief Pain Inventory (BPI), Pain Disability Index (PDI), Patient Health Questionnaire (PHQ), Pain Catastrophizing Scale (PCS), and Tampa Scale of Kinesiophobia (TSK);
  2. QST: pressure pain threshold (PPT) and temporal summation of mechanical pain (TSP);
  3. A standardized lift tolerance task.
- Five multiple regression analyses (dependent variables: pain severity, pain interference with physical function, pain-related disability, lift tolerance task, and depression) were used to determine the predictive capability of QST measures in the FAM while controlling for significant individual characteristics' covariates and psychological factors (pain catastrophizing and pain-related fear).

Table 1. Characteristics of the study sample.[a]

Characteristics	Value
Age	53.14 ±13.27
Gender	
Women	57 (71.3%)
Man	23 (28.8%)
Ethnicity	
Caucasian	66 (82.5%)
Other (African, Latino, Middle-Eastern, Unknown)	14 (18.5%)
Body mass index (BMI)	29.10±6.76
Comorbidity	2.84±1.37
Language	
French	43 (53.8%)
English	37 (46.3%)
Relationship status	
Single (unmarried, divorced, widowed)	52 (65%)
Partner (married, common-law)	28 (35%)
Education level	
School	29 (36.3%)
College	19 (23.8%)
Bachelor	18 (22.5%)
Professional	10 (12.5%)
Postgraduate (masters or doctorate)	4 (5%)
Pain duration (since pain onset to test date)	10.67±11.65

[a] Data of 80 participants are presented as mean ± standard deviation or n (%)

Results

- The results revealed that TSP factor was a predictor of BPI-pain severity (β = .248, t =2.576, p < .01), and PCS (p < .01) and TSK (p < .05) contributed to the variance.
- TSP factor was a predictor of BPI-physical interference (β = .252, t = 2.613, p < .01) and PCS (p < .01), TSK (p < .01) contributed to the variance.
- PPT factor was a predictor of PDI (β = -.321, t = -3.335, p < .01) and PCS (p < .01) and TSK (p < .05) contributed to the variance.
- PPT factor was a predictor of lift tolerance (β = .249, t = 2.281, p < .05) and gender (p < .01) contributed to the variance, whereas TSP factor failed to contribute in the variance (P > .05).
- PCS significantly predicted depression (β = .626, t = 6.786, p < .01), whereas TSK failed to predict and none of the QST variables were correlated to depression.

Table 2. Pearson's correlations of outcome variables with psychological factors of FAM, QST variables and potential covariates (N=80)

		Outcome variables				
		BPI Pain Severity	BPI Pain Interference	PDI	Lift Tolerance	PHQ
Psychological factors	PCS	.451**	.420**	.422**	0.013	.645**
	TSK	.361**	.383**	.295**	-0.075	.265*
QST variables	PPT_RH	-0.094	-0.042	-0.137	0.214	-0.116
	PPT_LH	-0.092	-0.132	-0.161	.311**	-0.055
	PPT_RUB	-0.132	-0.166	-.274*	.394**	-0.097
	PPT_LUB	-0.065	-0.134	-.277*	.429**	-0.108
	PPT_RLB	-0.190	-.221*	-.369**	.400**	-0.133
	PPT_LLB	-0.116	-0.143	-.240*	.359**	-0.057
	PPT_RC	-0.061	-0.135	-0.129	.312**	-0.018
	PPT_LC	-0.084	-0.218	-0.199	.349**	-0.012
	TSP_RH	0.176	.229*	0.161	-0.106	-0.045
	TSP_LH	0.119	0.139	0.152	-0.146	-0.071
	TSP_RUB	.224*	.222*	0.110	-0.168	0.071
	TSP_LUB	.261*	.249*	0.195	-0.183	0.000
	TSP_RLB	.282*	.395**	0.167	-.255*	0.052
	TSP_LLB	.249*	.289**	0.164	-0.165	0.106
	TSP_RC	.323**	.334**	0.156	-0.134	0.128
	TSP_LC	.284*	.328**	0.212	-.223*	0.039
Covariates	Gender	0.018	0.026	0.049	-.443**	-0.119
	Ethnicity	0.146	-0.074	0.105	-0.121	0.027
	Comorbidity	0.043	.233*	0.178	-0.167	0.128
	BMI	0.142	0.163	0.176	-0.172	0.168

Brief Pain Inventory (BPI), Pain Disability Index (PDI), Patient Health Questionnaire (PHQ), Pain Catastrophizing Scale (PCS), Tampa Scale of Kinesiophobia (TSK), Pressure Pain Threshold (PPT), Temporal Summation of mechanical Pain (TSP), Right Hand (RH), Left Hand (LH), Right Upper Back (RUB), Left Upper Back (LUB), Right Lower Back (RLB), Left Lower Back (LLB), Right Calf (RC), Left Calf (LC), Body mass index (BMI)

Table 3. Hierarchical regression analysis with (A) Pain Severity, (B) Pain Interference, (C) Pain Disability Index, (D) Lift Tolerance, and (E) Depression as the dependent variable (N=80).

Dependent Variable and Step no.	Variable	β	t (p)	R^2 change	F change (P value)
A. *Predicting Pain Severity*					
1	PCS	.335	3.289 (.002)**	.253	13.032 (.000)
	TSK	.229	2.265 (.026)*		
2	TSP factor (PCA-6fact)	.248	2.576 (.012)**	.060	6.633 (.012)
B. *Predicting Pain Interference*					
1	PCS	.269	2.738 (.008)**	.287	10.206 (.000)
	TSK	.283	2.905 (.005)**		
2	Comorbidity	.181	1.948 (.055)	.093	5.564 (.006)
	PPT_RLB	-.124	-1.286 (.203)		
	TSP factor (PCA-7fact)	.252	2.613 (.011)**		
C. *Predicting Disability*					
1	PCS	.344	3.385 (.001)**	.205	9.905 (.000)
	TSK	.210	2.056 (.043)*		
2	PPT factor (PCA-4fact)	-.321	-3.335 (.001)**	.102	11.121(.001)
D. *Predicting Lift Tolerance*					
1	Gender	-.334	-3.199 (.002)**	.196	19.039 (.000)
2	PPT factor (PCA-7fact)	.249	2.281 (.025)*	.081	4.249 (.018)
	TSP factor (PCA-2fact)	-.110	-1.057 (.294)		
E. *Predicting Depression*					
1	PCS	.626	6.786 (.000)**	.418	27.688 (.000)
	TSK	.057	.619 (.538)		

All β and t values from the final regression model. *p<.05, **p<.01.
Pain Catastrophizing Scale (PCS), Tampa Scale of Kinesiophobia (TSK), Pressure Pain Threshold (PPT), Temporal Summation of mechanical Pain (TSP), Right Lower Back (RLB), Principal Components Analysis (PCA).

Conclusion

- Pain sensitivity measures contributed to the FAM by showing additional predictive value in all outcomes, except depression.

Key references

Vlaeyen, J.W.S., & Linton S.J. (2000). Fear-avoidance and its consequences in chronic musculoskeletal pain: A state of the art. *Pain*, *85*(3), 317-332.

Wideman, T.H., Asmundson, G.G.J., Smeets, R.J.E.M., et al. (2013). Rethinking the fear avoidance model: Toward a multidimensional framework of pain-related disability. *Pain*, *154*(11),2262-2265.

Uddin, Z., & MacDermid, J.C. (2016). Quantitative Sensory Testing in Chronic Musculoskeletal Pain. *Pain Med.,* 17(9),1694-1703.

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Acknowledgments

CRIR Centre de recherche interdisciplinaire en réadaptation

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