

Supplementary File 5. Application of the proposed framework to the development of a screening tool for autoimmune rheumatic diseases

In the proposed framework to improving symptom appraisal, Social Cognitive Theory (SCT) and main constructs of symptom appraisal, detection, interpretation and response to symptoms, were linked by approaches developed based on the six major concepts in SCT (*reciprocal determinism, behavioral capacity, expectations, self-efficacy, observational learning and reinforcements*)(1-3). We shall illustrate how the proposed framework and approaches could be incorporated into the development of screening tools using joint swelling and Raynaud's phenomenon (RP), a common and a distinctive symptom respectively seen in patients with autoimmune rheumatic diseases (ARDs), as examples.

Joint swelling may or may not be noticed, especially in the early stages of diseases when it is mild and not accompanied by other symptoms/signs. Knowledge of what joint swelling is, what a swollen joint looks like (sight) and how a swollen joint feels like (touch) using text (symptom knowledge) (*behavioral capacity*); and illustrations of the different appearance of a swollen joint and a normal joint using photos and different sensations when touching a swollen versus a normal joint using normal body sites for comparison can act as a prompt and allow an individual to notice their similar joint changes (symptom self-examination and comparison) (*behavioral capacity* and *self-efficacy*)(4). RP is characterized by the triphasic color change in digits (the skin of digits first turns white, then blue and finally red in the ischemic, deoxygenation and reperfusion phases, respectively) resulting from vasospasm and ischemia in response to cold or emotional stimuli(5). While the dramatic color changes in digits are often not neglected, description of the color changes (sight) during an attack of RP using text (symptom knowledge) (*behavioral capacity*) and demonstration with cold water using short videos can help one confirm the presence or absence of RP (symptom self-examination and comparison) (*self-efficacy* and *observational learning*).

Following the detection of joint swelling and RP, individuals might attribute the meaning of these bodily changes first to situational factors such as cold weather based on their own knowledge (such as their own experience, self-education or observation from others)(6, 7), and only if the situational factors are insufficient to explain these bodily changes, to illness(8). Provision of the likely causes of joint swelling and RP (symptom knowledge) could thus allow one to make more appropriate attribution of their symptoms and in turn their response to the attribution (*behavioral capacity*). Depending on the meaning attributed to the detected symptoms/signs, individuals may decide to take no actions, self-monitor, self-manage, consult family or friends, or seek medical attention(3). Instruction on symptom response, namely, actions to take upon the detection of joint swelling and RP (such as reporting and help-seeking) (*behavioral capacity*), and demonstration of prompt symptom detection and response (*self-efficacy* and *observational learning*) and its positive outcomes (e.g., using video clips of role models) (*expectations* and *reinforcements*) could lead to more appropriate responses to one's symptoms/signs (on screening tools) and in turn facilitate early identification of potential cases in the population.

References

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