

Short Communication

Work Load and Heart Rate in Fibromyalgia: The Hub within “Pain Gaps” and Clinical Pain

Kerstin Wentz^{1*} and Trevor Archer²¹Department of Occupational and Environmental Medicine, Sahlgrenska University Hospital, Sweden²Department of Psychology, University of Gothenburg, Sweden**Abstract**

Unlike recovery from fibromyalgia (FM), the phenomenon of short or long lasting pain free episodes or ‘gaps’ in FM pain occurs in one third of the patients. Parallel the characteristics of physiological adaptation to workload of this sub-group of patients with FM remain unknown. A physiological adaptation examination that included a stepwise load increment submaximal exercise test concerned women presenting FM with chronic pain, women presenting FM with gaps in pain and healthy volunteers. Measurements from the test were compared using a between-groups analysis of variance showing that gaps in clinical pain were contingent upon heart rate (HR) at different levels of workload. Women with gaps in FM pain were older than women with FM without pain free episodes. Gaps in FM pain are discussed from the perspective of physiological characteristics of clinical FM pain and psychological functioning.

INTRODUCTION

Recovery from fibromyalgia (FM) induced pain is spares but from longitudinally designed studies the incidence of remission of clinical pain has been found to be in the order of 3 % [1,2]. A similar modest incidence of recovery was documented by Felson and Goldenberg [3], who also suggested that recovery from FM presents a transitory state. Wentz et al. [4], used a naturalistic design regarding the psychosocial context of this unusual event and found that recovery was preceded by a decrease in mental load and thereafter relied on less dissociative functioning.

In contrast to recovery from FM the phenomenon of short lasting pain free periods [5], pain free periods [6,7] or gaps in FM pain Wentz [8], occurs very frequently. Henriksson [5], and Cöster et al. [7], described the situation that around one third of the patients reported the dissipation and subsequent the coming back of the clinical pain.

Whereas the phenomenon of pain free periods has been mapped within the boundaries of various research designs, these gaps in the pain experience were the sole target of Wentz [8]. In this account, she interviewed women presenting FM who had experienced gaps in pain and found that the women in most cases not consciously strived for the pain free episodes. Instead, the disappearance of pain occurred in rather an unplanned fashion. Consequently, pain free episodes were found to be regulated environmentally by for example warmth, physiotherapeutically paced exercise, unwinding conditions including e.g. holidays

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abroad and soothing or gratifying conditions. The gaps in pain ended under the “reversed” conditions. While various psychosocial regulatory considerations including activity patterns and self-care concerning pain free episodes were explored by Wentz [8], the potential neurophysiological characteristics of this sub-group of patients remain unknown. Among these unexplored characteristics must be enumerated the physiological adaptation to individuals’ workload.

MATERIALS AND METHODS**Pain and physiological adaptation in women presenting fibromyalgia**

A physiological adaptation examination presented by Lange et al. [9], included a stepwise load increment submaximal exercise test on an electronically braked cycle ergometer to the ‘very hard’ perceived exertion level [9,10]. A study group of women presenting FM was compared to an age and education-matched group of healthy volunteers. The test setting included a variety of recordings among which included pain at baseline and pain after the test using a visual analog scale (VAS). Outside the test setting the research design covered also different psychometric instruments including, a Health related Quality of Life Short Form (SF-36) scale mirroring the level of clinical pain or every day pain over 4 weeks termed bodily pain (BP) [11].

Interference from everyday pain in terms of BP concerning the whole study group presenting FM was shown to be best predicted

by the heart rate (HR) expression at different levels of workload. This intersection between HR and workload was captured by the sum of variables mirroring HR at two or three levels of workload; 25 W, 50 W and 75 W [10]. In parallel, the result from the sub maximal-test showed no relationship between BP and HR at baseline. The same pattern concerned the examined link between BP and HR at the individual level of peak performance and between BP and the achieved level of peak performance in terms of workload. Moreover, this pattern of absence of a relationship concerned also BP and the rated physical exertion (RPE) at any level of workload during the test. Everyday pain in terms of BP did also not correlate with increase in fibromyalgia pain from the test.

RESULT AND DISCUSSION

Gaps in F pain

From a research design point of view, gaps in everyday pain may be regarded as a property of clinical FM pain in terms of BP. This perspective upon pain free episodes was examined while the present research design included recordings on gaps in clinical pain and almost one in three of the women presenting FM reported pain-free episodes.

Gaps in pain may easily be assumed to represent less severe extent of fibromyalgia in terms of "FM light", but collected data from the instruments that were completed in the homes before the sub-maximal test rendered these assumptions untenable. Instead, analysis of variance showed that the level of clinical pain BP did not differ between women with gaps in pain and women without gaps in pain ($F(1, 20) = 0.252, p = 0.621$). Parallel analysis of variance indicated that that women presenting gaps were significantly older with a mean of 55.6 years as compared to women without pain gaps with a mean of 45.9 years ($F(1, 20) = 6.427, p < .02$).

As already described from the sub maximal test the level of clinical "everyday" pain BP was related to the intersection between workload and heart rate [10]. Regarding the phenomenon of clinical pain being intermittent the intersection between workload and HR might also be important. Furthermore, self-rated regular physical activity (PhA) did not affect the intersection of

HR and work load in women with FM [9]. This pattern of results presents a contrasting pattern to physiological adaptation in healthy women. PhA may therefore also potentially play a role in intermittent FM pain.

A between-groups one-way ANOVA including a Tukey-HSD post hoc test was performed in order to ascertain whether women presenting FM with chronic pain, women presenting FM with gaps in pain and healthy volunteers differed significantly. The analysis with regard to the three groups concerned the variables; PhA [9], HR at baseline, HR at 25 W workload, HR at 50 W workload and HR at 75 W workload (Table 1).

The between group ANOVA showed a significant effect from the groups compared regarding all variable except for HR at baseline. Women with gaps in FM pain exercised less than healthy women. Despite this fact the women with gaps in pain showed in principle, the same HR as healthy women at the examined three levels of work load. At these levels of work load women with chronic pain differed from women with intermittent pain and healthy women.

At all three examined levels of work load women with gaps in FM pain and healthy women volunteers expressed responses that were different from women presenting FM with continuous pain. Parallel levels of HR at baseline did not affect pain-free episodes or the level of BP. Clinical pain and gaps in clinical pain may be suggested to be contingent upon physiological adaptation (HR) to a moderate-to medium challenge represented by 25 W, 50 W and 75 W levels respectively. Importantly, HR adaptation at 25 W, 50 W and 75 W corresponded also to the intersection of physiological adaptation and workload were the FM group as a whole differed from healthy women volunteers as described by Lange et al. [9], also reporting that on subsequent levels of workload physiological adaptation in terms of HR was the same for both groups. In consequence, with an emphasis on moderate challenge, physiological adaptation at sub-maximal peak performance and achieved level of work load together with rated exertion were found to be unrelated to BP.

In the result from Wentz [8], on gaps in pain these occurred without specific gestures or manners. These circumstances pertained to environment regulation that was rather undramatic,

Table 1: One-way ANOVA examining the effect of group in terms of Women with FM; chronic pain, Women with FM; gaps in pain and healthy women on Physical activity, HR at baseline, HR at 25W workload, HR at 50 W work load and HR at 75 W work load. A Tukey post hoc test examined the reference of significant differences to the three groups.

Variables	Df between and within groups	F-value	P-value	Women with FM; chronic pain (M, SD)	Women with FM; gaps in pain(M, SD)	Healthy women(M, SD)
Physical activity	2 43	3.597	.036 a	2.07 .829	1.63 .744	2.46 .779
HR baseline	2 45	.349	ns	66.4 20.9	63.4 6.7	62.9 8.0
HR at 25W	2 44	10.075	.000b	99.2 8.4	87.6 5.3	87.1 8.7
HR at 50 W	2 43	11.326	.000 b	115.8 12.4	101.0 8.1	98.4 10.3
HR at 75 W	2 35	6.012	.006 b	136.1 16.1	117.2 12.9	114.1 15.1

a= Women with FM; gaps in pain are significantly different from healthy women $p < 0.05$ b=Women with FM; gaps in pain and healthy women volunteers are significantly different from Women with FM; chronic pain $p < 0.001$.

not least concerning the return of pain. The occurrence of termination of a pain-free episode involved, e.g. returning home after an amusing 'get-together' with friends or a relaxing holiday abroad or after well-paced exercise with a physiotherapist. The significance and dependence upon environmental regulation for the symptoms may also bring to the fore difficulties regarding self-regulation in FM; more than 55% of the examined patients presenting FM have been found to experience symptoms similar to PTSD symptoms [12]. Moreover, a prevalence of 43% regarding PTSD in FM has been identified together with temporal links between PTSD and fibromyalgia symptoms also. Therefore, FM and PTSD were regarded as potential risk factors for each other while both were associated with antecedent traumatic experiences [13]. From the perspective of physiological adaptation to a stressor, there is another interesting similarity between FM and PTSD in terms of both showing a more "fixed" pattern when compared to healthy persons [9,14,15] or as to PTSD also with reference to panic disorder [14]. In contrast, the present study on pain disparities the result shows a similar HR response in women with gaps in FM pain as in healthy women.

A very high prevalence of self-rated symptoms of PTSD presents apart of the present study result (manuscript in preparation). Regarding psychological dysregulation that is captured by psychometric instruments aiming at PTSD this may leave the individual with great difficulty 'un-winding'. For a both psychological and physiological relaxed state to "happen" [8], this leaves external regulation as the only feasible possibility. Permissive physiological circumstances maybe the other factor resulting in a gap in pain. It may be suggested also that instead relentless pain indicates a mismatch between a protective fixation of the ANS and different modes of load demanding physiological responses.

Women reporting gaps in clinical pain were older than women with chronic pain (without pain free episodes). This may be explained by an observation made by Silverman et al. [16], whereby after more than 10 years from onset of symptoms there was a modest increase in the proportion of patients reporting mild severity than among patients with shorter duration. They suggested that this event mirrored adaptation or improved self-regulation dealing with a supposedly chronic disease. A tentative but yet positive interpretation of the event of women presenting gaps in FM pain exercised less than healthy women is that adaptation implied less persistent self-regulation. In parallel, less persistent self-regulation characterizes the condition of being 'on parole' from fibromyalgia in terms of full remission of symptoms [4].

CONCLUSION

Women with gaps in FM pain showed the same HR as healthy women at three levels of work load but exercised less than healthy women. The women with gaps in clinical pain were markedly older compared to women without pain free episodes. These events suggest that a gap in pain without intent results from improved self-regulation dealing with e.g. the chronic disease and from permissive physiological circumstances.

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