

Commentary

Does a subgroup of postpolio patients need different management?

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Abstract

Throughout the 30 years of postpolio syndrome (PPS) research, there have been many puzzling anomalies in the data and not enough information to make sense of them. It is therefore welcome that Winberg et al have examined physical activity in relation to life satisfaction, sex and age. They hypothesized that activity would decrease with age and found the opposite. This result is not so surprising as Ostlund et al found that vitality was associated with older age and that younger age was associated with more pain, increasing physical fatigue, decreasing sleep quality and reducing activity. This commentary will examine past postpolio research with unexpected results in order to describe a subgroup of patients who may be more susceptible to overusing muscles and have particular exercise and activity needs. © 2015 Elsevier Inc. All rights reserved.

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Postpolio syndrome (PPS) refers to the new weakness, muscle fatigue, general fatigue and pain occurring after at least 15 years of stability following an initial episode of acute polio.¹ Throughout the 30 years of PPS research, there have been many puzzling anomalies and not enough data to make sense of them. It is therefore welcome that Winberg et al have examined physical activity in relation to life satisfaction, sex and age.² They hypothesized that activity would decrease with age, but found the opposite. Using the Physical Activity and Disability Survey (PADS) and a pedometer, they found that among those with mild or moderate polio effects older participants spent significantly more time being active than younger participants, although there were no significant differences in the pedometer results. This is not so surprising as Ostlund et al found that vitality was associated with older age, and that younger age was associated with more pain, increasing physical fatigue, decreasing sleep quality and reducing activity.³ They reasoned that older people may have developed more coping strategies. Subsequently this team studied a group of fatigued and non-fatigued PPS patients and suggested that there is a subgroup of fatigued younger patients with shorter polio duration, more physical and mental fatigue,

more pain, lower quality of life and higher body mass index.³

The possible existence of PPS subgroups is an important consideration. Although every polio patient has different residual effects and must be treated individually, the disease is conceptualized similarly in each case, as a loss of motor neurons with subsequent enlargement of motor units which then succumb to metabolic stress. However, some motor neurons also remained damaged. Their effects are unknown and they may not be able to support larger motor units.⁴ Also, some polio patients are affected in only one area, while others were left with more widespread, sometimes hidden, subclinical effects. It could be that, although the older group were experiencing PPS deterioration due to new weakness, they had never had pain, whereas the younger group may have always had more physical fatigue and pain. Management remains basically the same for all cases, pacing and exercise.⁵

The generally accepted paradigm is that increasing physical activity is to be encouraged,^{2,6} although postpolio patients must constantly be alert to overuse symptoms due to muscle fatigability, which may not be apparent until after activity. Monitored exercise is recommended for almost all postpolio patients, with exceptions only for severely weak muscles.⁷ So far no research has been done to try and ascertain whether overuse causes permanent new weakness or muscle fatigue.⁵ This commentary will examine past postpolio research with unexpected results in relation to polio

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recovery, initial polio age, pain and fatigue, in order to describe a subgroup of patients, who may already be over-using muscles in daily activity after pacing and have particular exercise and activity needs.

Severe and mild polio as PPS risk factors

Counterintuitive results have puzzled researchers since early in PPS research. The first few PPS studies in the 1980s concentrated on those who had the most severe polio and demonstrable new weakness to make a more convincing case for PPS, and the results showed that those at most risk of developing PPS had had polio over the age of 10 (polio was more severe with increasing age) and were severely affected but had recovered well and led an active life.⁸ Soon studies were done on wider populations and the results became more contradictory. Ramlow et al⁹ conducted one of the first population studies and found that only 4% used a wheelchair after recovery and about a third had no permanent effects after the initial polio, in contrast to an earlier study by Halstead and Rossi¹⁰ where 53% used a wheelchair. Ramlow et al found that in mild and moderate cases it was remaining impairment, rather than the good recovery found in severe cases, which was a risk factor for PPS, suggesting an alternative route to PPS. Another significant risk was being female. In a large population study of 1315 people who had polio, Lønnberg¹¹ found that although there was a linear relationship between rising severity of paralysis and risk for PPS, this relationship was less clear cut with rising initial polio age, as those who were youngest when they had polio had a higher risk than would be expected.

Two symptom patterns: weakness or muscle fatigability

The main symptoms of PPS are new weakness, pain and fatigue, but studies have repeatedly found that the new weakness does not correlate with pain and fatigue, suggesting that as well as two risks for PPS (more or less recovery), there may be two symptom patterns, one involving new weakness, the other involving muscle fatigability and pain, although in most cases both patterns will coexist to some extent. Early polio studies used a PPS definition in which weakness was the defining PPS symptom,¹² but more recent definitions use weakness or abnormal muscle fatigue,¹ widening the scope of research. Willen and Grimby¹³ found that PPS pain positively correlated with physical exertion and spontaneous walking speed but not degree of muscle weakness. Those who were using muscles closest to maximal capacity experienced the most pain, so possibly this capacity was affected by muscle fatigue. In a population study of 350 people who had polio, Nollet et al¹⁴ found that neither pain nor lack of energy related to polio residuals. This was a particularly young group (mean 44.4 years) with a young polio age (mean 5.4 years).

In another study of volunteers with a median initial polio age of 2 years, there were no muscle strength differences between the PPS and non PPS groups, but perception of exertion and problems with repetitive muscle fatigue were higher in the PPS group.¹⁵ This same team found that having muscle pain and fatigue in the stable period after recovery from polio was the greatest predictor of developing PPS, and an indication that muscle fatigue and overuse are influences on developing PPS.¹⁶

Risk factors for PPS pain

Focusing solely on pain, Vasiliadis et al found that risk factors for PPS muscle pain included female gender and duration of general fatigue.¹⁷ This pain did not relate to severity of the initial polio or severity of current weakness. For joint pain, the risk factors were female gender, stability of symptoms, younger age at interview, and weaker lower extremities. Among the risk factors for higher pain perception (SF-36 bodily pain scale) were female gender, younger age at polio, increased weakness at polio, and increased duration of muscle fatigue. As only joint pain was related to degree of motor unit involvement, the authors suggest that muscle and joint pain have different causes. Could the joint pain be the result of muscle weakness destabilizing the joint, and muscle pain be a result of muscle fatigue and overuse? The study did not assess activity levels, but Klein et al found that pain was more frequent in women and younger age groups and activity levels were not related.¹⁸

Pain, age and PPS

The first study to examine pain and age in PPS was a quality-of-life study which compared PPS patients with a Swedish reference group, finding that PPS patients had more pain and lower physical ability than the reference group up until the oldest group, 75–82 years.¹⁹ The period in which pain was highest in the PPS patients was 45–54 years. It was lower during the years 55–74, and lower still in the eldest group, who had no more pain than the reference group. One would expect that the polio patients aging with new weakness, as well as other impairments, would experience more pain than the reference group. More recently, Werhagen and Borg conducted a study of long-standing nociceptive (overuse) or neuropathic pain in PPS patients and found that 90% had overuse pain, and those who were younger and had polio at an earlier age had significantly more pain, as did women, who also had pain in more body regions than men.²⁰

Two subgroups

The studies by Ramlow, Lønnberg, Vasiliadis, Nollet and Ivanyi help to clarify Ostlund's subgroup of younger

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