Exercise and the Immune System

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Exercise and the Aging Immune Function

- Physical therapy goals involve optimizing a client's mobility and endurance. Thus, a physical therapist should be aware of the effects of physical exercise on immune function.
- Elderly individuals constitute a growing and important consumer group of physical therapy services. Since immune function declines with aging, it is important we understand the effects of exercise on immune function.

Age-associated changes in the immune system:

- The changes in immune system with aging are seen both in the innate and adaptive immune systems.
- Older age is associated with thymic involution, decreased number of naïve T cells and increased number of memory and effector T cells, with a contraction of the T-cell repertoire.
- B cells numbers decrease with aging. Immunoglobulin levels typically do not decline but response to vaccine wanes with aging.
- In the innate immune system, overall numbers of natural killer (NK) cells increases, however the function of these cells decline with aging. Aging is often associated with chronic inflammatory state characterized by elevated levels of proinflammatory cytokines such as IL-6 and TNF-α.
- The clinical effects of immunosenescence are reflected in higher rates of malignancies, infections and autoimmune diseases. Moreover, chronic

inflammation itself is recognized as a risk factor for vascular disease and malignancy.

Effects of Exercise Training on Immune Responses in Elderly:

- A systematic review of 17 prospective clinical trials examining the effects of different exercise interventions by Haaland et al provided little or no evidence for acute or chronic changes in lymphocyte subsets, with the exception of CD8 positive T cells, that may be transiently elevated by acute exercise. Further, there was no evidence that regular exercise altered phenotypic aspects of lymphocytes such as activation and/or costimulatory marker expression.
- Evidence from one trial indicated that regular aerobic exercise can enhance cellular and humoral aspects of immunologic memory, at least in the context of influenza vaccination.
- Aerobic training, but not strength training, is associated with down-regulation of chronic inflammation and may in part explain associations between exercise and reduced vascular disease.
- The specific effects of aerobic training in reducing chronic inflammation may also be of benefit in prevention of other diseases known to be triggered in part by chronic inflammation and associated with aging, such as autoimmune diseases and cancer.
- No prospective controlled trials have clearly documented clinical immunologic benefits of regular exercise, which may well relate to underpowering of these studies.

Implications for Physical Therapist:

- The physical therapist should be aware that intense exercise [exercising at >80% of maximum oxygen consumption (VO_2 max)] is known to suppress immune function, particularly in young individuals.
- It takes 6-24 hours for the immune system to recover from the acute effects of intense exercise.
- Each individual client must be evaluated after exercise to determine the perceived intensity of the exercise or intervention session. For example, in the deconditioned older adult with compromised cardiopulmonary function, reduced oxygen transport, and impaired mobility, ambulating from the bed to the bathroom may be perceived by their body as intense exercise. However, in a recent study, intense exercise was shown not to have a detrimental effect on immune function and incidence of infections in the elderly.
- While the suppressive effects of intense exercise on immune function may differ between young and elderly persons, intense exercise during an infectious episode should be avoided in both the young and elderly clients.
- For anyone (especially competitive athletes) wondering whether or not to exercise in the presence of acute bacterial or viral infection (e.g. when manifesting constitutional symptoms), do a neck check. If the symptoms are located above the neck, such as stuffy or runny nose, sneezing, or a scratchy throat, exercise should be performed cautiously through the scheduled workout at half speed. If, after 10 minutes, the symptoms are alleviated, the workout can be finished with

the usual amount of frequency, intensity, and duration. If, instead, the symptoms are worse and head is pounding or throbbing with every footstep, the exercise program should be stopped and the person should rest.

- If there is fever or there are symptoms below the neck, such as aching muscles, a hacking cough, diarrhea, or vomiting, exercise should not be initiated. Finally, because of vasodilation occurring from inflammation associated with infection, patients may experience orthostatic hypotension and hypotension with functional activities. Consequently, frequent blood pressure monitoring and gradual changes in positions, particularly from recumbent to upright positions, are important to promote tolerance to functional activities.

Based on:

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