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From the Director, Virginia Center on Aging

Edward F. Ansello, Ph.D.

Benefits of Physical Activity on Depression

Depression saps one's energy and enjoyment of things. It's too common in later life. We may feel persistently sad, useless or empty. We may curtail our daily activities.

A growing body of research, however, is showing that physical activity may protect against depression. The irony, of course, is that depression may encourage inertia and discourage activity. The adage that the greatest challenge in any race is taking the first step may well apply.

If one can motivate to initiate physical activity, the potential benefits seem to be substantial.

Two recent separate studies by teams at Harvard University and elsewhere have examined whether physical activity can affect depression and vice versa, and whether physical activity can modify the risk for depression even among those with genetic risk factors for depression.

The first study, "Assessment of bidirectional relationships between physical activity and depression among adults," conducted by a team of researchers led by Karmel Choi and Jordan Smoller, appears in *JAMA Psychiatry* (2019). The researchers asked the question, "Does physical activity have a potential causal role in reducing risk for depression?"

Depression is a prevalent condition, one with troubling consequences for the individual and the society at large. While major depression is less frequent among older adults than younger counterparts, late life depression is an important public health problem. So, identifying effective strategies to prevent or reduce depression can ultimately improve population health.

While recent studies suggest that physical activity may protect against the risk for depression, it's not clear if there's a causal relationship between the two and if this causality goes in both directions: physical

exercise causing less depression and more depression causing less physical activity. As the researchers here note, "If the relationship between physical activity and depression is not causal, recommendations to promote physical activity, while beneficial for other health outcomes, would yield limited results for depression."

The research team had access to both de-identified, self-reported exercise data and objectively measured (wrist-worn, accelerometer-based) data on physical activity from adults in the UK Biobank Study (for physical activity data) and to the Psychiatric Genomics Consortium (for data on Major Depressive Disorder-MDD) from adults of European ancestry. Together, they had information on over 611,000 adults.

"We found evidence of a protective causal relationship between accelerometer-based physical activity with MDD. In contrast, we found no statistically significant evidence of a relationship between self-reported activity and MDD...In the other direction, across all methods, we found no evidence of causal relationships of MDD with accelerometer-based activity."

The researchers estimated a moderate but significant reduction of MDD risk for every one SD (Standard Deviation) increase in objectively measured physical activity. They state, "One SD of objectively measured physical activity in the UK Biobank Study has been reported to be approximately 8 milligravities of acceleration in a mean 5-second window of analyzed accelerometer data." Thankfully, the authors translate what this means for everyday life: "roughly what we might observe in a 24-hour period if—for example—a person replaced sedentary behavior with 15 minutes of vigorous activity (e.g., running); just more than one hour of moderate physical activity (e.g., fast walking); or some combination of light activity (e.g., standing, stretching, easy chores) and more vigorous activity."

In sum, they "examined self-reported and objectively

measured (i.e., accelerometer-based) physical activity and discovered that findings on the relationship with depression are specific to objectively measured—but not self-reported—activity. Meta-analytic data have shown that self-report and objective measures can yield discrepant estimates of physical activity. Self-report measures of activity may be affected by mood states and cognitive biases that also affect mental health, making it difficult to ascertain whether observed associations are true or simply artifacts of a common liability. For example, individuals vulnerable to depression may perceive themselves as more inactive and disengaged than their peers or compensate by over-reporting activity. Although this does not invalidate the utility of self-reported measures, verifying their conclusions with objective measures is essential.”

Regarding the inverse relationship between physical activity and depression, the researchers “found evidence of only one direction of this relationship, where physical activity demonstrated a potential causal relationship with depression, while depression does not appear to have such a relationship with physical activity. Other factors may better explain the observed depression-activity relationship rather than depression directly compromising physical activity. For example, underlying conditions such as chronic pain could interfere with activity and lead to depression.”

This study’s findings strongly support the importance of objective measurement of physical activity in epidemiologic studies of mental health, as well as the hypothesis that more physical activity can be an effective prevention strategy for depression.

The second study, “Physical activity offsets genetic risk for incident depression assessed via electronic health records in a biobank cohort study” published online in the *Journal of Depression and Anxiety* (November 5, 2019) examined whether physical activity could reduce the risk of depression even among adults with genetic predispositions for depression.

These researchers had access to health data in the on-going Partners Biobank, where thousands of adults in the greater Boston area have provided DNA samples which they made available for research.

These individuals had also filled out a lifestyle questionnaire that included their exercise habits, such as frequencies of activities like walking, biking, using exercise machines, and yoga classes. The researchers examined their DNA data, looking for genetic variations associated with increased risk of depression, and scored the individuals as having low, moderate or high inherited risk.

The researchers accessed the volunteers’ electronic health records (EHR) to identify those with incident episodes of depression, based on two or more diagnostic billing codes for a depressive disorder within two years following their lifestyle survey, and no such codes in the year prior to completing the lifestyle questionnaire.

“We tested main effects of physical activity and polygenic risk scores on incident depression, and effects of physical activity within stratified groups of polygenic risk.

“Using clinical EHR data, we observed that higher levels of physical activity at baseline were linked to significantly reduced chances of appearing in the healthcare system with a depressive disorder over the next two years. Descriptive findings indicated that individuals engaging in three or more hours of activity per week showed reduced prevalence of incident depression. Regression models indicated that individuals experienced a 17% decrease in the odds of incident depression for each one *SD* (standard deviation) increase in reported activity, roughly equivalent to four extra hours of activity per week. Together, this suggests that approximately 45 additional minutes of physical activity each day could translate to meaningful reductions in a person’s risk for depression.”

So, physical activity can be an effective counter-measure against depression. Activity need not be strenuous and it may reduce the risk for depression, even among those with a family history or genetic disposition for depression. And depression in itself may not cause a reduction in physical activity. It could be that we will see health care providers increasingly *prescribing* doses of physical activity for our mental health.