

Research Bites, January 2024, by Mary Yoke, PhD, FACSM, MA, MM

Up Your Game by Hollowing while Planking!

In an interesting cross-sectional study published in the *International Journal of Environmental Research and Public Health* (1), authors Garcia-Jaén et al compared a standard plank (prone) with a similar plank performed with abdominal hollowing. Their objective was to see if a plank performed with the hollowing maneuver increased the activation of the core muscles more effectively than a traditional plank exercise in which hollowing was not emphasized.

In case you're not familiar with the term "hollowing", please let me explain. Hollowing is a term traditionally used by Pilates instructors; its usage however has now become a bit more mainstream. It is synonymous with the drawing-in maneuver, in which the deep core muscles (the transverse abdominis and the internal obliques) are emphasized. The goal is to imagine pulling the abdominal musculature inward, as if the navel could internally move posteriorly and touch the spine. Pilates instructors also call this action "scooping", because if you're lying in the supine position and hollowing your abdominals, it feels as if you're scooping out the abdominal area—in effect making it concave. So: hollowing, drawing-in, scooping, concave—all are synonymous and useful descriptors for the action in question!

But is hollowing effective? Does it recruit more musculature in a plank than just holding the position without drawing-in?

To find out, Garcia-Jaén et al recruited 20 physically active participants without back pain (13 male, 7 female; average age: 24.25 years) and assessed them during two experimental conditions: the traditional, standard plank, and a plank performed with abdominal hollowing. During both trials, the electrical (EMG) activity of the rectus abdominis, external obliques, internal obliques, and the lumbar portion of the erector spinae was measured, along with rate of perceived exertion (RPE). All participants were specifically trained in the correct performance of the traditional plank and the plank with abdominal hollowing. The authors write that the following progression was used to teach proper performance of the desired action to the participants prior to testing: (1) the abdominal hollowing maneuver was first performed while standing, (2) then while lying prone on the floor, and (3) then was finally integrated into the

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actual plank exercise. During assessment, participants performed three 10-second sets of each condition. It may be useful to describe the specific abdominal hollowing protocol used in the study. Here are the instructions given to the participants while in the traditional plank position: “Draw the navel in and up while not allowing any movement of the spine, rib, or pelvis and then holding the abdominal contraction for 10 s while breathing normally.”

The results? Performing the hollowing maneuver resulted in greater total EMG responses; in other words, the intensity of the overall muscular effort was increased. More specifically, there was significantly greater activation of the lumbar erector spinae, the transverse abdominis, the external obliques, and the internal obliques with hollowing. It’s not too surprising to note that participants’ RPE was also significantly higher when performing a plank with abdominal hollowing, as well. Regarding the rectus abdominis: the level of activation in both the traditional plank and the plank with hollowing was not significantly different between conditions.

In summary, it appears that adding abdominal hollowing to the traditional plank exercise results in enhanced core muscle activation and force production, both of which are important for core stability and strengthening.

Does Physical Activity Help Preserve Your Brain?

It’s no secret that a large percentage of the U.S. population has officially entered the older adult demographic, driven by the aging of Baby Boomers (born between 1946 and 1964). Of these, approximately 1 in 9 people over the age of 65 has Alzheimer’s disease. Unfortunately, as of now, Alzheimer’s Disease has no cure; it is the sixth leading cause of death (2). A key question: is Alzheimer’s Disease (along with other forms of dementia) preventable?

There are, in fact, some hopeful strategies. Chief among them appears to be regular physical activity—a major domain for readers of this journal. In a 2023 study by Bangen et al, published in the *Journal of the International Neuropsychological Society* (3), it was found that physical activity, especially moderate-to-vigorous physical activity, helped preserve memory and executive brain function in healthy older adults.

In this study, 43 healthy older adults (average age of 72 years; 74.4% female) met the author's criteria for age-appropriate cognitive functioning (using the m-TICS assessment). They subsequently wore ActiGraph accelerometers for approximately one week, 12 hours per day, in order to have their level of physical activity measured. Participants' brains were then assessed via magnetic resonance imaging (MRI) and other brain imaging procedures. Various dementia, memory, and verbal fluency assessments were given to measure cognitive functioning.

It was found that greater time spent performing moderate-to-vigorous physical activity was associated with higher memory scores and better executive functioning. (Note: executive functioning, thought to occur in the brain's prefrontal cortex, includes attentional control, self-awareness, verbal working memory, and problem-solving skills). In contrast, light physical activity appeared to be more effective in enhancing cerebral blood flow, which is important in supplying brain neurons with nutrients and oxygenated energy. It was concluded that both moderate-to-vigorous physical activity and light physical activity are beneficial for cognitive functioning, preservation of healthy white matter in the brain, and protection against the decline in brain health that can occur with aging. The authors write that more studies are needed to clarify cause and effect associations between physical activity intensity and specific effects on brain tissue and function. Even so, this study provides increasing evidence that regular physical activity is good for the brain!

Does Your Neighborhood Confer Protection Against Cardiovascular Disease?

The answer may be yes, if your neighborhood scores well on the national walkability index (NWI). Authors Makhoul et al, in a 2023 cross-sectional study (4), wanted to see if there was an association between walkable neighborhoods and cardiovascular disease risk factors.

First though, what exactly is a walkable neighborhood? According to the National Walkability Index (5), a walkable place is easy to walk around. It's easy to reach stores, restaurants, parks, jobs, and more, simply by walking there from your home. Such an environment encourages residents to be more physically active, which then helps reduce the incidence of obesity, cardiovascular disease, diabetes, and other lifestyle-related diseases. Not

coincidentally, reliance on driving, other seated transportation, and fossil fuels is therefore reduced as well.

Moreover, a walkable environment is defined as one that has a center (e.g. a main street or a public space), enough people to keep businesses thriving, readily accessible public transportation, affordable housing located near businesses and schools, pleasant public spaces and parks that encourage activity and recreation, parking lots behind buildings (not in front of them), and streets that are designed for bicyclists and pedestrians; as a result, most errands can be accomplished on foot (6).

In the Makhoul et al study, block groups in neighborhoods (70,123 census tracts; total U.S. population of 315,221,353) were ranked from 1-20 (1 = least walkable; 20 = most walkable). This information was linked with a Centers for Disease Control and Prevention (CDC) dataset that showed local incidence of heart disease and cardiovascular risk factors (hypertension, high cholesterol, obesity, and diabetes). After adjusting for age, sex, race and socioeconomic position, there was found to be a significant relationship between the walkability index of a neighborhood and the likelihood of cardiovascular disease and risk factors. In other words, the lower the walkability the greater the prevalence of disease; conversely, the greater the walkability the lower the incidence of disease. When looking at specific risk factors, the data can be parsed as follows when comparing low walkability neighborhoods to high walkability neighborhoods:

Risk Factor/Disease	Low walkability neighborhood incidence	High walkability neighborhood incidence
Coronary artery disease	7.0%	5.4%
Hypertension	35.5%	29.7%
High cholesterol	34.5%	29.2%
Obesity	35.0%	30.2%
Diabetes	11.6%	10.6%

Such findings provide further evidence of what we already know: physical activity and walking are good for us! Perhaps urban planning and neighborhood design constitute the next frontier for getting people to move!

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