Commentary

Lifestyle Habits of Senior Executives and Implications for Cognitive Function

A Cross-Sectional Study

Sharon McDowell-Larsen, PhD

Abstract

Lifestyle behaviors such as exercise, diet, smoking, and alcohol consumption can profoundly affect long-term health outcomes like cardiovascular disease, diabetes, and cancer as well as acute and long-term cognitive function. For those in leadership roles, stamina, a baseline level of good health, and optimal cognitive function are important for leadership performance and sustainability. The purpose of this study is to describe various biometric markers and lifestyle behaviors of senior level executives and the implications for health, leadership, and brain function. Data were collected from male ($n = 2925$) and female ($n = 574$) executives who attended the Leadership at the Peak (LAP) course at the Center for Creative Leadership (CCL) between November 2007 and July 2018. Fifty-two percent of male participants and 48% of female participants were maintenance exercisers. Only 2.2% of males and 0.7% of females were current smokers. Average servings of alcohol per week were 5.6 and 4.5 for males and females, respectively. However, 23% of executives reported drinking little to no alcohol. The average number of hours of sleep per day was 6.6 hours for both male and female executives. On average, executives were slightly overweight with an average body fat percentage of 22.6% for males and 30.1% for females and an average waist circumference of 82.7 cm and 97.5 cm for males and females, respectively. Non-high-density lipoprotein levels were above ideal at 138.3 mg/dL for males and 125.2 mg/dL for females. Daily servings of fruit and vegetable consumption was less than ideal, averaging 4.7 servings a day for females and 3.7 servings for males. Overall, senior executives are healthier than the average American; however, given that their jobs are cognitively de-

INTERNATIONAL JOURNAL OF
DISEASE REVERSAL
and PREVENTION

manding, strategies such as eating more nutrient-rich plant foods and getting adequate sleep and regular exercise are increasingly important.

Introduction

As of 2017, 60% of adults in the United States were suffering from at least one chronic condition and 42% from multiple conditions.[1] The cause is not lack of appropriate drugs or procedures, which are necessary in some cases, but is, for the most part, the accumulated damage of poor lifestyle choices.

To quote one article, "Most people with major chronic diseases share multiple common lifestyle characteristics or behaviors, particularly smoking, poor diet, physical inactivity, and obesity. Tobacco, poor diet, and physical inactivity have been identified as leading contributors to overall mortality in the United States."[2]

The European Prospective Investigation into Cancer (EPIC) studied 23 000 peoples' adherence to four simple behaviors (not smoking, exercising 3.5 hours a week, eating a healthy diet [fruits, vegetables, beans, whole grains, nuts, seeds, and limited amounts of meat], and maintaining a healthy weight [BMI < 30]). It was calculated that by adhering to these behaviors, 93% of diabetes, 81% of heart attacks, 50% of strokes, and 36% of all cancers would be prevented.[3]

The INTERHEART study, which included 52 countries, found that a healthy lifestyle as described above would likely prevent 90% of all heart attacks.[4]

Despite this overwhelming evidence to support lifestyle factors as a way to treat and prevent chronic health conditions, fewer than 3% of the US population meet minimal criteria for healthy eating, regular exercise, not smoking, or limiting alcohol consumption. The purpose of this article is to describe various biomarkers and lifestyle behaviors of senior level executives, those who are at the helm of the military, global businesses, and non-profit organizations, and to discuss the implications of these behaviors for cognitive function, leadership image, and health.

Methods

Data was collected from executives who attended the Leadership at the Peak (LAP) program at the Center for Creative Leadership (CCL) between November 2007 and July 2018. The LAP program is a leadership development program designed for senior executives who lead and manage large segments of for-profit, non-profit, or military organizations. Participants need to meet eligibility requirements in order to gain entry into the program, ie, they need to be at the senior level and have wide-scale responsibilities. For example, all the military branches send most of their high-ranking leaders to the program as part of their ongoing leadership training.

The LAP course is offered 24–30 times per year in Colorado Springs, Switzerland, and Singapore. The course is one of many offered by the CCL, a global, non-profit organization that focusses exclusively on leadership development, from entry level employees to high potentials, to mid-level managers to senior leaders. CCL is research-focused and has performed seminal work on multi-rater 360 instruments, women leaders, and millennials.

While the larger goal of the LAP program is leadership development, integral to the course is a focus on fitness and health. This is included in the program with the recognition that the work of leading requires stamina, energy, and a baseline level of

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www.ijdrp.org

Vol. 3, No. 1. 2021

Lifestyle Habits of Senior
Executives and Implications
for Cognitive Function

S. McDowell-Larsen

good health. As such, attendees participate in fitness activities throughout the week and are provided coaching and education regarding fitness and nutrition. On Day 1 of the program used for this study, lipids were measured via a finger stick blood sample and total cholesterol, high-density lipoprotein (HDL), and triglycerides were assessed using a Clinical Laboratory Improvement Amendments (CLIA) waved point of care (POV) lipid analyzer. The POV analyzers used to asses blood lipids were the Cholestech LDX and the CardioChek Plus. Both devices have been shown to produce clinically equivalent values when compared to the same patients' samples analyzed in a reference laboratory. A recent study reported the average difference calculated from the actual individual paired percentage bias paired with the Integra analyzer was -7.8% for total cholesterol, -6.2% for HDL, and 5.1% for triglycerides for the CardioChek and 0.5% for total cholesterol, -4.5% for HDL, and -3.3% for triglycerides for the Cholestech. This is well within industry standards of ±10% for total cholesterol, ±12% for HDL, and ±15% for triglycerides.[5] Waist circumference was measured at the level of the umbilicus. Percent body fat was calculated using the 7-site formula of Jackson and Pollock.[6]

Prior to attendance at the program, participants completed an extensive questionnaire regarding their lifestyle habits, including exercise, smoking, alcohol consumption, sleeping, and eating behaviors. Data for this article were collected from November of 2007 through July of 2018. It was collected in compliance with CCL and the European Union's General Data Protection Regulation rules of consent and privacy.

Results

Subject Characteristics

Of the 2925 executives attending LAP during the above timeframe, 80.4% were male ($n = 2351$) and 19.6% were female ($n = 574$). For biometric and subject characteristics, see Table 1.

### Table 1. Subject Characteristics and Biometric Data

	Males ($n = 2925$)	Females ($n = 574$)
Age, y	48.8 (SD 6.4)	49.5 (SD 5.6)
Height, in	71.0 (SD 2.8)	65.4 (SD 2.8)
Weight, lbs	193.8 (SD 29.5)	151.5 (SD 30.5)
Body fat, %	22.6 (SD 5.7)	30.1 (SD 7.1)
Waist circumference, cm	97.5 (SD 12.2)	82.8 (SD 12.4)
Work hours per week, hrs	56.2 (SD 8.4)	56.9 (SD 8.8)
Hours of aerobic exercise/week	4.8 (SD 4.0)	4.1 (SD 3.5)
Servings of fruits and vegetables/day	3.7 (SD 2.1)	4.7 (SD 2.3)
Weekday hours of sleep/night	6.6 (SD 0.8)	6.6 (SD 0.9)
Total Cholesterol, mg/dL	190.0 (SD 37.1)	195.1 (SD 35.2)
LDL Cholesterol$_{calc}$, mg/dL	115.2 (SD 33.2)	106.5 (SD 33.0)
HDL Cholesterol, mg/dL	51.2 (SD 15.5)	69.8 (SD 17.8)
Non-HDL Cholesterol, mg/dL	138.3 (SD 31.1)	125.2 (SD 36.0)
Triglycerides, mg/dL	128.7 (SD 95.3)	104.1 (SD 64.7)
Alcohol servings per week	5.6 (SD 5.5)	4.5 (SD 4.6)

Exercise Behaviors

The stages of exercise behavior, as assessed by the transtheoretical model, are presented in figure 1.[7] Fifty-two percent of male and 48.2% of female executives reported being maintenance exercisers. Less than 1% reported being in the pre-contemplative stage and close to 30% reported being in the preparatory stage.
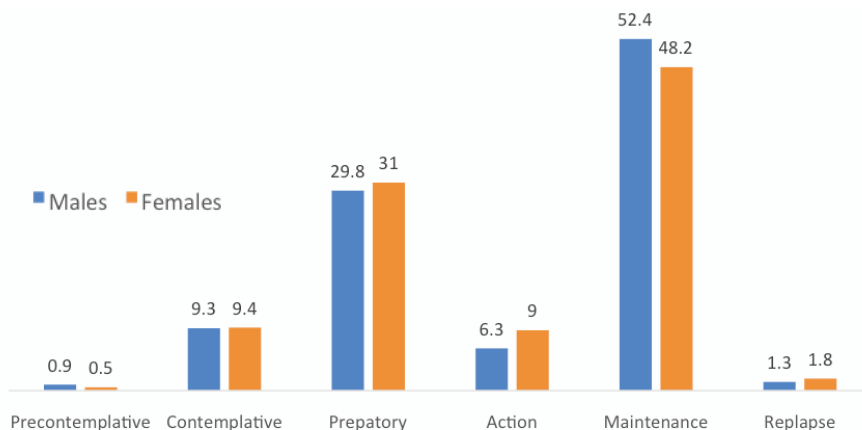
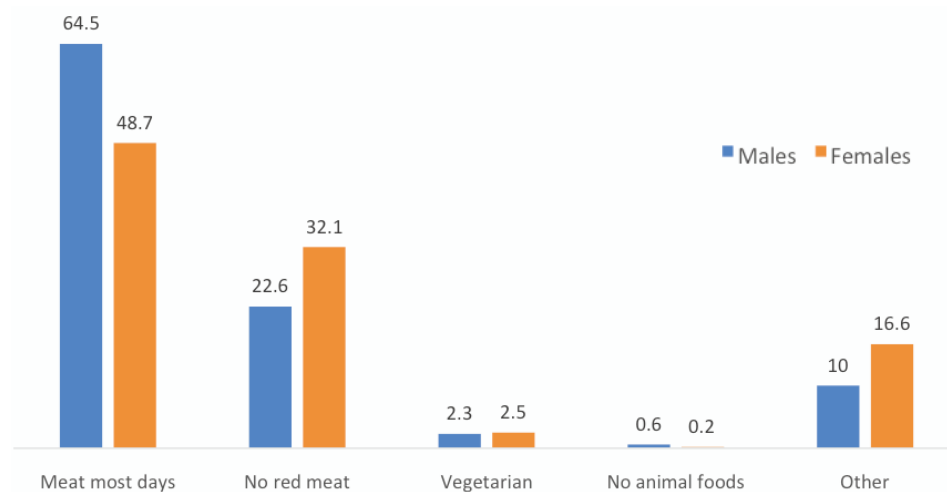**Figure 1. Percentage of Executives in Various Stages of Exercise Behavior**

Additionally, the amount of time spent exercising across all the stages was 4.8 (SD 4.0) hours per week for males and 4.1 (SD 4.0) hours per week for females.

Yet, only 15.2% of females and 17.6% of males reported that they were satisfied with their level of fitness. Indeed, most (53.3% and 61.4% of male and female executives, respectively) reported being very dissatisfied with their level of fitness.

A higher percentage of executives are engaged in regular exercise compared to the average person in the United States where only 26% of males and 19% of females are getting the recommended amount of exercise.[8] However, there is room for improvement, as almost half of the executives in this study do not exercise on a regular basis.

Diet

The reported daily servings of fruits and vegetables was 4.7 (SD 2.3) for females and 3.7 (SD 2.1) for males (Table 1). Only 5.4% of females and 2% of males reported eating the recommended nine or more servings per day. Fifty-four percent of females and

Figure 2. Percentage of Executives Reporting Various Dietary Patterns

www.ijdrp.org

Vol. 3, No. 1.   2021

Lifestyle Habits of Senior
Executives and Implications
for Cognitive Function

S. McDowell-Larsen

73% of males ate fewer than five servings per day. Thus, increasing fruit and vegetable intake represents a significant opportunity for improving the healthfulness of executives' diets.

More women than men (32.1% and 22.6%, respectively) reported eating no red meat, while relatively few reported eating no meat (2.3% and 2.5%) or no animal foods (0.6% and 0.2% for males and females, respectively) (Figure 2).

Alcohol Intake

Alcohol consumption (wine, beer, or hard liquor) was reported at 5.6 (SD 5.5) servings per week for males and 4.5 (SD 4.6) servings for females (Table 1). Twenty-three percent of male and female executives reported that they drank little to no alcohol.

Smoking

The percentage of current smokers was very low at 2.2% for males and 0.7% for females (Figure 3). The percentage of those who had never smoked was also high—68.6% for males and 76.8% for females. The females who did smoke were relatively light smokers averaging only 5.6 cigarettes per day while males who smoke averaged 12.8 per day.
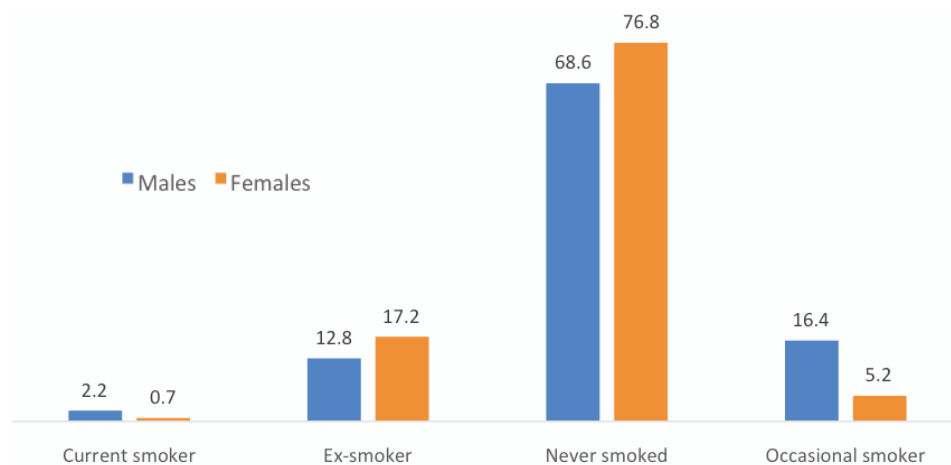
Figure 3. Percentage of Executives Reporting Various Smoking Behaviors

Sleep

Average hours of sleep during the week was 6.6 hours per night for both males and females (Table 1). Weekend sleep hours averaged 7.7 for females and 7.5 hours per night for males. About 51% reported that they got seven or more hours of sleep during the workweek.

Measures of Obesity

Average levels of percent body fat were 22.6% (SD 5.7) for males and 30.1% for females (SD 7.1). While ideal levels of percent body fat are not well established, a more important indicator of risk is waist circumference. Average levels were 82.7 cm (SD 12.4) for females and 97.5 cm (SD 12.2) for males. This is slightly above recommended levels, which are below 80 cm and 94 cm for females and males, respectively.

Lipids

Total, non-HDL, HDL, low-density lipoprotein (LDL), and triglyceride levels are presented in Table 1. Non-HDL, however, is a better predictor of risk than LDL or total cholesterol as it includes both atherogenic subfractions, LDL, and very low-density lipoprotein (VLDL).[9] On average, both male and female executives had levels that

were higher than ideal. *Note*: Relatively few reported taking cholesterol-lowering medications (5.8% for males and 2.6% for females).

Discussion

To the authors' knowledge, there is limited previously published data on lifestyle behaviors specific to senior executives. Overall, senior executives are healthier than the average American; however, given that their jobs are cognitively demanding, strategies such as consuming more nutrient-rich plant foods, not smoking, limiting alcohol consumption, managing body weight, and getting adequate sleep and regular exercise are increasingly important. Based upon our findings, significant improvements in these areas can be made.

"Physical activity is cognitive candy," writes John Medina, a brain researcher and the author of *Brain Rules*. He goes on to say, "Research has consistently shown that exercisers outperform couch potatoes in tests that measure long-term memory, reasoning, attention, problem solving and fluid intelligence."[10] Brain plasticity, important for learning and memory, also improves with exercise. Physical activity promotes positive neuroplasticity, increases cognitive reserve, and promotes neuronal connection density, resulting in improved cognitive function. By contrast, poor neuroplasticity results from physical inactivity, poor nutrition, and substance abuse.[11] In short, bad habits hurt learning and good habits improve it.

Leaders who exercise are also perceived more positively. Previously published research by McDowell-Larsen and Kearney found that those who exercised regularly received higher ratings on two multi-rater leadership assessment instruments, the Executive Success Profile (ESP) and the Campbell Leadership Index (CLI), suggesting that executives who exercise are viewed as being more effective.[12]

Eating a nutrient-rich diet, one that is high in antioxidants, fiber, and other phytonutrients may contribute to improved cognitive function.[13] One study found that higher consumption of fruits, vegetables, whole grains, and mushrooms was associated with improved performance on numerous tests of cognitive function in a dose-dependent manner.[14] Walnuts, berries, mushrooms, leafy greens, spices, and high-fiber foods like whole grains and beans are associated with slower cognitive decline and improved cognitive function.[15,16] Conversely, dietary patterns high in animal and processed foods are associated with a significant increase in risk of dementia and specifically Alzheimer's disease.[17,18,19] Meals high in saturated fat, of which animal foods are the most significant source, have shown acute cognitive impairment.[20]

Additionally, daily consumption of animal foods increases risk for many diseases via substances inherent in animal foods or produced as a result of cooking or consuming animal foods such as heterocyclic amines (HCAs), advanced glycation end-products (AGEs), trimethylamine oxide (TMAO), inflammatory cytokines (via bacterial endotoxins and pre-formed arachidonic acid), cholesterol, saturated fat, and animal protein.[21–27]

Thus, eating more whole-plant foods and fewer animal foods is an area where executives could significantly improve their short and long-term brain function as well as decrease their risk for chronic conditions later in life.

On average the executives in our sample did not drink excessively; however, there was a large amount of variability, with some drinking little to no alcohol and others drinking far more than is recommended. Along with concerns of acute cognitive impairment, long-term consumption of alcohol may impair brain health and function. A 2017 study that followed subjects over 30 years found that alcohol consumption

www.ijdrp.org

Vol. 3, No. 1. 2021

Lifestyle Habits of Senior
Executives and Implications
for Cognitive Function

S. McDowell-Larsen

was associated with hippocampal atrophy as well as impaired white matter microstructure within the brain in a dose dependent manner.[28] From a health perspective, a recent multinational study found that those who drink as few as six drinks per week have a greater risk of premature death.[29] Even moderate amounts of alcohol can increase risk for a number of cancers including cancers of esophagus, larynx, breast, and colon.[30] Alcohol can also be disruptive to sleep, which is oftentimes insufficient for many executives.[31]

Apart from the multitude of health problems caused by tobacco use, smoking may negatively affect executive image. There is a strong negative stigma associated with smoking in the United States, more so when chief executives smoke. This was highlighted as far back as 1997 in a *Wall Street Journal* article entitled "When Chief Executives Smoke, It Becomes Everyone's Business," which talked about the negative image of smoking to an executive's image.[32] This could be one reason why so few executives smoke.

Consistently shortchanging sleep can be costly for leaders. Not only does it compromise long-term health, it interferes with cognitive function such as memory, attention, and the ability to make connections. Lack of sleep also erodes creative problem solving, self-awareness, energy, and interpersonal savvy—all of which are important leadership attributes.[33] This can happen without the affected person being fully aware of the associated decline in cognitive function. One study found that after four days of shortened sleep, study participants reported feeling fine, even as their cognitive performance continued to be impaired.[34]

Overall, executives have much lower rates of obesity than the general population. As to whether this represents a selection bias or there is some other factor at play is hard to determine. A previous study by King et al and the CCL found that higher waist circumference, an observable cue of obesity, was negatively associated with evaluations of leaders across hierarchical levels, even after controlling for BMI, physical activity, and other characteristics. The study concluded that hierarchically based status, such as being a CEO, are insufficient in overcoming the stigma of obesity.[35] Of greater concern for leaders, however, is that obesity is associated with impaired cognitive performance, accelerated cognitive decline, and pathologies such as dementia in later life.[36]

Atherosclerosis is extremely uncommon in societies where serum total cholesterol and LDL cholesterol are <150mg/dl and <100mg/dl, respectively.[37] Accumulating data consistently demonstrate that levels much above these, atherosclerosis and heart attacks will develop, all things being equal.[37,38] Elevated cholesterol levels and plaque buildup in the cranial arteries is also associated with an accelerated risk of cognitive decline.[39] Atherosclerosis, however, is a multi-faceted disease. Other lifestyle and dietary factors can influence whether an individual will have a heart attack or stroke in addition to their level of cholesterol. For example, L-carnitine and choline, found in meat, dairy, and eggs, are converted by select gut bacteria to trimethylamine then oxidized in the liver to trimethylamine N-oxide (TMAO). Chronic high levels of TMAO have been shown to more than double the risk (2.54) of major adverse cardiovascular events, after controlling for risk factors such as cholesterol.[21]

Conclusions

There is a growing recognition that leading in today's environment is demanding and cognitively exhausting. In order for leaders to thrive mentally and physically in an increasingly disruptive world, engaging in healthy behaviors is more important than ever.

To quote Bob Johansen, founder of the Institute for the Future, "If you want to be a leader in the VUCA [Volatility, Uncertainty, Complexity, and Ambiguity] world of

www.ijdrp.org

Vol. 3, No. 1. 2021

Lifestyle Habits of Senior
Executives and Implications
for Cognitive Function

S. McDowell-Larsen

the future, I believe you will need to be extremely healthy, not just routinely healthy. If you're going to thrive in a disruptive world, you're going to have to make good choices."[40]

Extreme health goes beyond just the absence of disease. It means engaging in the full spectrum of healthy lifestyle behaviors such as regular exercise, eating a plant-strong diet, getting good sleep, managing stress, and having strong social support systems. Indeed, this is similar to the lifestyle of the Blue Zones, those communities of people around the world who thrive into their 80s, 90s, and even their 100s.

Engaging in healthy behaviors can positively impact cognitive function, a leader's most important asset. Poor diet, lack of sleep, excessive alcohol consumption, smoking, and little to no exercise all impair acute cognitive function and brain health over time.

Knowledge is power, especially related to senior level executives. Given that these are highly motivated individuals, we have found that providing evidence-based information about diet and exercise can prompt profound lifestyle changes. To quote a high-ranking military leader, who made dietary changes after attending the LAP program:

> Other than a bite of camel in the United Arab Emirates, a mouthful of squid in Egypt, and a piece of shrimp in Jordan, all for diplomatic reasons … I've been a 100% plant-based consumer for nearly six months. My body has adjusted, inside and outside. Jet lag in multiple time-zone travels is not an issue. Thirty-one pounds of weight melted away. Cholesterols dropped from continuously elevated to continuously normal — more than 25 points down in LDL. The last time I had numbers like these was more than 26 years ago.

Physicians and clinicians can significantly improve the health and cognitive performance of senior executives by taking time to educate and support the incorporation of health promoting behaviors into their daily routines.

"The first wealth is health."
— Ralph Waldo Emerson

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www.ijdrp.org

Vol. 3, No. 1.   2021

Lifestyle Habits of Senior
Executives and Implications
for Cognitive Function

S. McDowell-Larsen

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