

THE JOY OF MOVEMENT, by Kelley McGonigal, Ph.D.  
A Book Report by David G. Schwartz, M.D.  
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It seems we can't emphasize too much the importance of physical activity, and any encouragement for exercise making you feel good is a great thing, thus we do an encore presentation from last year.

Many books tell us about the health benefits of exercise. This one says it brings us joy. Now that could be a deal maker for people who know they want to do more physical activity but just have a hard time motivating themselves to actually do it. What if we could get people "hooked" on it, so they just couldn't do without it? I also reported on her book, The Upside of Stress, in the archives. She has a way of convincing us that some things we often consider to be unpleasant, can actually make us feel better, depending on our attitude and how we go about them.

People who are regularly physically active have a strong sense of purpose, experience more gratitude, joy, love, hope, and feel more connected to their community. The joys come not so much from fitness, but from *movement itself*. These benefits have been demonstrated in people with all sorts of conditions, including hospice care.

The author talked to anthropologists, psychologists, and physiologists, she studied philosophers and religious scholars, and she interviewed family, friends, strangers, athletes, and exercise professionals. Exercise had rescued the author herself from isolation and despair.

How exercise increases happiness is not just endorphins, which it does. It influences many other brain chemicals, reduces brain inflammation, and remodels brain structures to be more receptive to joy and social connection. During exercise, muscles release hormones that provide more resilience to stress. Human beings are "hard wired" in our DNA, to take pleasure in activities that help us survive. Much of movement is the joy of connection. Throughout human history, movements such as ritual, labor, and play have helped us to collaborate and celebrate. While investigating this issue for the book, she noticed just "how marvelous, how miraculous, we humans can be."

The exercise high may have come as a survival benefit to hunters and gatherers (who cover most of human history) to keep hunting and gathering, on which their lives depended. The Hadza in Tanzania, one of the last hunter-gatherer tribes in Africa, engage daily in two hours of moderate to vigorous activity and several more hours of light activity, the same for young and old, both men and women, and they often become more active as they age. This level of activity is what human bodies are adapted to. Contrast this to the USA, where the average adult gets less than 10 minutes of vigorous to moderate activity per day, and physical activity peaks at age 6. The Hadza have no cardiovascular disease, lower blood pressure, cholesterol, and inflammatory markers than Americans, and have no anxiety or depression. Of course they eat a much more healthful diet also (my comment).

In the US, activity captured by an accelerometer correlates with happy moments and a sense of purpose in life. Experiments forcing moderately active adults to become temporarily sedentary resulted in fatigue, anxiety, hostility, depression, and decreased life satisfaction. The daily step count to induce anxiety, depression, and decreased satisfaction with life needed to be decreased to 5,649 steps. A general recommendation for good health is 10,000 or more (my comment). The average daily step count in this country is 4,774 steps per day. Around the world, the average is 4,961, so this is a world wide problem.

About one to two million years ago, hominids developed longer thigh bones, smaller forearms, and wider shoulders, all things that make more efficient running stride, as well as stiffer and non-grasping feet, compared to earlier hominids living in trees before climate changes made more open savannas and less forestation. Modern humans have large gluteal muscles and stronger achilles tendons, more slow-twitch muscle fibers that resist fatigue, and more mitochondria in running muscles, compared with other primates. We are also the only primates with a nuchal ligament that fixes the base of the skull to the spine. It keeps the head from bobbing while running. Wolves and horses, also running species, also have this nuchal ligament. We are made for running.

Cycling, running, and hiking, which make sustained moderate intensity activity, cause the release of endorphins, endogenous (internally produced) opioids, and endocannabinoids (endogenous cannabis). We are like the dogs and wolves that are adapted to chasing prey over long distances. Ferrets, on the other hand, on the treadmill, do not release endocannabinoids. Ferrets are not adapted to running. They forage for easy prey such as eggs and toads. In contrast, we are adapted to long distance chasing. Nature provided these pleasurable, rewarding feelings to keep hunters and gatherers going, because that activity can be uncomfortable, tiring, and boring. When mice are injected with a drug that blocks the endocannabinoids before running, the braveness, the reduced anxiety, and the persistence in running are all blocked.

Whatever activity is chosen, continuous, moderate intensity activity for at least 20 minutes can give a “high” that runners experience. It isn’t a *running* high. It is a *persistence* high. It seems that it is not just the actual exercise that brings the high. It is the continuing on, in spite of the difficulties and pain, that gives the confidence after accomplishing something difficult.

This reminds me of one of this author’s other books, [The Upside of Stress](#), about which I wrote a report, now in the archives. When a stressful situation is seen not as an annoyance or frustration, but as a challenge, and especially when shared with others, or when it brings connection with others, it has a positive rather than negative effect on the body’s health.

Endocannabinoids also encourage social connection, and when people exercise together in a class, they tend to make eye contact and get mutual encouragement. Blocking endocannabinoids not only eliminates the runners’ high, but also it interferes with the desire to connect with others. Exercise clubs forge strong, lasting bonding.

The exercise the hunter gatherers endure promotes sharing. Those societies are incredibly social and cooperative and built on mutual trust. We could use a dose of that in our society (my comment).

Regular exercise increases the density of the binding sites for endocannabinoids, so the brain becomes more sensitive to any things that activate the endocannabinoid system. The brain can take in more joy from several sources.

People get “addicted” to exercise, but it takes regular exercise several times per week for about 6 weeks, until a person gets “hooked.” It requires the right amount of exercise, the right type for that person, and the right place and time. The author thinks that if you do that, almost everyone could get hooked. She gives examples of people who were sedentary and did not like exercise at all, but with the proper introduction, they became lifelong athletes. Some people who finish last in a marathon still do it with joy. Other things or activities associated with the exercise become cues to trigger a rush of pleasure, because it reminds them of the activity.

Besides the endorphins, endocannabinoids, and serotonin, exercise also triggers the release of dopamine, which is in the main reward system in substance addiction. This helps explain the addiction to exercise. However, the main difference with exercise is that the dopamine rush is much smaller, and it's not the only neurotransmitter released. With drug addiction, total dopamine and the activity of the dopamine receptors diminish with each use, so that the person needs more and more of the substance to get the same amount of high and needs more just to feel normal, not even high, so that without it he or she feels worse than before the drug was ever used in the first place. See my article in the archives about Dr. Robert Lustig's book, [The Hacking of the American Mind](#), which explains some of how addictions work.

With exercise, the down regulating of dopamine does not occur, and miraculously, circulating dopamine and dopamine receptors actually increase. So the reward system is more sensitive to normal pleasures in life, such as social connection, food, beauty, etc., and less exercise is needed to get the high. This is probably why exercise helps people break their addictions to alcohol, drugs, etc. In fact many athletes are in recovery from those addictions. In both animal and human studies, exercise reduces cravings for nicotine, morphine, etc. In 25 randomized trials, exercise had a large antidepressant effect in people with major depressive disorder. A 2017 meta-analysis of studies showed that exercise is an effective treatment for anxiety disorders.

There is also a genetic component which makes some people's brains more sensitive to the effects of exercise than others, and they more quickly get hooked on it.

The author herself as a child had poor athletic ability, but she soon discovered that exercise decreased her baseline anxiety, so she persists in exercise even though she may not be "good at it."

Exercising 3 times per week for 6 weeks increases neural connection in the brain that decrease anxiety, and lactate that builds up in muscles during exercise goes to the brain and alters neurochemistry in ways that reduce anxiety and depression.

The brain's reward system wasn't originally developed for addiction but for *commitment*. The things that give us pleasure create desire for situations or activities that enhance our survival, like being in love to strengthen social connections, a mother longing to be with her baby, and the high of exercise strengthening our commitment to health.

Dr. McGonigal emphasizes the importance of group activities, the outdoors, and music in activating people to enjoy movement.

The author describes *collective joy*, a transcendental experience in which people feel a loss of boundaries, a sense of oneness and wonder, when they exercise together. This is most especially when they make the same movements in unison, in synchrony, in a class or group. It also releases endorphins. This is not just thinking of connection but *sensing* connection, as if the body is a part of a greater whole. From perceiving other bodies moving with its own, the brain interprets other people's bodies as extensions its own. A dancer describes this as *the kinesthetics of togetherness*. This can result in more self confidence and social ease. When we move together, we become invested in the well being of those with whom we move, and do more sharing, helping, cooperating.

Doing physical actions together in unison, like marching in step, develops "we-agency," a feeling that it is one organism, building confidence. In "walkathon" fundraisers, people walking together open up to each other and feel more comfortable sharing their feelings, hopes, aspirations, etc. Dancing

together in close proximity in time with the music fosters even closer connection, especially when you can smell each others' "happy sweat," which smells different from regular sweat. The synchrony that develops can lead to getting "outside yourself," and a feeling of ecstasy.

Some obstacle courses are designed to instill terror in anticipation of the obstacles, but feeling good after passing through it, often with cooperation and help from other participants. This results in confidence, having mastered the courage to do this. When people perceive a painful physical activity as helping them to achieve their goals, their brains release higher levels of endorphins and endocannabinoids than with easier tasks. The author highlights several examples of people with disabling conditions training in a class to do things perceived as impossible, and succeeding with joy, relief, and greater self-confidence.

Moving to music starts in infants before language, walking, or crawling emerge. Lying motionless in a scanner listening to music, peoples' brain regions used for motor activity activate and begin to consume more energy, with no movement of the physical body. The neurologist Oliver Sacks wrote "When listening to music, we listen with our muscles." Traditional peoples sing and chant while working together. Athletes having "hit the wall" in exhaustion, hearing music, had the extra energy to get to the finish line. Patients running on the treadmill for a cardiovascular stress test could go 51 seconds longer with music than without. A scientific review in the Annals of Sports Medicine and Research concluded that music is a legal performance-enhancing drug. Music induces the brain to release adrenaline, dopamine, and endorphins.

Sports psychologist Costas Karageorgis, working with Olympic athletes, chooses playlists for each athlete's headphones. Not only the music, often 120-140 beats per minute, but also the lyrics that include words like "Go! Go! Go!" or "work," or "run." With moderate levels of intensity, the music makes the activity feel easier, and then at higher intensities, it adds a positive meaning to physical discomfort. The author, in a class, turned the resistance wheel up because she wanted to feel the pedals "push back."

Specific dance movements and music throughout the world that express joy, are mostly of fast tempo, loud beat, high pitched, and in a major key. Movements are fast, big, and vertical, with bounces, leaps, and jumps, gestures with upward gaze, chest open, arms overhead, as if one had just thrown confetti into the air.

People with Parkinson's Disease (who have rigid muscles and expressionless faces), dancing to music in a group, were able to loosen up and to make faster and more coordinated movements with greater ease, and they also could increase facial expression, emotional communication, and the mirroring of others' expressions. The author gives examples of people who were severely disabled and or near death, shocking their families by getting up and dancing when music was played in a group.

People watching others doing challenging feats feel the activity empathetically in their own bodies, and then they desire to do the same thing. This is an important part of doing things in a group or class.

Being outdoors in the natural environment allows people to experience more of the present moment, not ruminating about the past or worrying about the future. Being absorbed in natural surroundings, the brain shifts into *soft fascination*. People troubled with depression, with the brain in the default mode of wandering thoughts, chatter, imagery, mostly in a negative mode of worry, anxiety, guilt, etc., find that being in nature shifts away from that mode into fascination with the present moment, a different default mode. Meditators also, in focusing the mind, interrupt the chatter of the default mode. With much

experience in meditating, meditation in action allows mindful focus on the moment during a variety of activities. Being in nature brings about this shift almost immediately, and exercise in nature is a powerful tool for recovering from depression, anxiety, etc. In the archives, see my article on [Nature Fix](#), by Florence Williams, about a full spectrum of benefits from being in nature, using all the senses of smell, hearing, sight, feeling, etc.

When people connect with nature, they often get a sense of unity, wonder, and transcendence. The class of drugs that most closely resemble this experience is the *entheogens*, that include psilocybin, ayahuasca, and LSD, for consciousness expanding, reorganizing the default state to feelings of oneness with the universe.

Community gardens provide green space for building social infrastructure, so lacking in modern urban society. See my article in the archives on [Palaces For the People](#), by Eric Klinenberg, about social infrastructure, including community gardens. The *cortisol awakening response* is the surge of cortisol in early AM that gets us up. Many people with depression lack that experience. After volunteering for the Green Gym for 8 weeks, people had a 20% increase in the cortisol awakening response and less depression.

Athletes in ultra-endurance marathons in doing fantastic feats, speak of “suffering well,” and joy and suffering coexisting simultaneously. This resembles the wisdom of spiritual traditions.

Many athletes use the lessons learned from endurance marathons to apply to depression and grief. One described the depression as, “When the pain is so bad and the path forward so unclear that you can hardly believe how many moments of suffering a minute can hold.” How similar to when a runner “hits the wall,” and can only walk. This is like the description Shawn Bearden makes of his near collapse while running an ultra-marathon. “Every part of me screamed to stop, you feel like you can’t move, it’s not possible to continue to move, yet somehow you still can. Your muscles feel extremely heavy, like gravity is fifty times stronger than it usually is...A helpless exhaustion.” Yet with walking, and then jogging some more, he finished the race. He uses running to cope with his own depression.

Many studies show exercise being remarkably beneficial for overcoming depression, as effective as drugs. Sometimes when I run or lift weights, I think about how the determination to persist in spite of discomfort carries over into my handling the challenges of other things in my life.

The strategies the athletes use resemble those used by survivors of trauma, or people trying to stay sober, “one day at a time,” staying in the present moment, not looking too far ahead, just on more mile, one more lap, one more step. Many of the endurance athletes have histories of depression, trauma, and addictions. Shawn credits the sport with helping to save his life.

Many athletes tap into positive emotions, bringing to mind music, treasured memories, loved ones, talking to God, etc. They will say that the activity taught them strategies for living, for handling other things in life, strengthening faith and courage.

I remember an explorer talking on TV about his long trek to the north Pole on foot. In response to the question about what contributed most to his stamina in completing his successful journey, he said, “It’s all mental.”

Most ultra marathons are out in the natural environment, and in conjunction with the discomfort or suffering, is the exhilarating majestic beauty of nature, that moves some to tears of joy.

The author tells many stories of unbelievable achievements of endurance, and the commitment of the athletes to return to the challenge after major injuries. She asks the question, “Is it because they possess the innate capacity to keep going? Or does the training itself produce their remarkable hardiness? She says it is a mixture of both.

Ultra endurance athletes have extra high levels of irisin, a myokine produced by muscles during activity, not just in the endurance athletes, but every time anyone exercises the muscles, although at lower levels than in the endurance athletes. The muscles produce other myokines besides irisin, and many are called *hope molecules*. That reminds me of Greta Thunberg’s statement, “Hope? When you take action, then hope is everywhere.”

Irisin helps the body burn fat for fuel, stimulates the brain’s reward system, is antidepressant, enhances motivation, learning, and cognitive function, and may be protective against neurodegeneration and Alzheimer’s. Other myokines beside irisin include 35 proteins that strengthen muscles, regulate blood sugar, reduce inflammation, and kill cancer cells. One of these proteins, Brain Derived Neurotrophic Factor (BDNF), produced not just by the brain but other parts of the body, protects neurons and can help generate new neurons. Another myokine, glial-derived neurotrophic factor, protects dopaminergic neurons, (the ones that are dying in Parkinson’s Disease). Exercise has been proven to markedly improve PD symptoms, and maybe it could actually reverse this condition.

One endurance athlete, Terri Schneider, with a fear of heights, as part of an adventure race had to climb straight up a 1200 foot cliff. After the climb, she said it was not a matter of overcoming fear, but creating a relationship with the fear in which she can control how she experiences the fear. She can look at it, analyze it, and decide how to respond.

The most memorable events for the athletes are moments when one athlete helps another who is in trouble, injury, pain, etc. The ultra endurance athletes see other athletes as family, evidence of human interdependence.

This book gives an amazing narrative of people pushing beyond their limits to experience courage, joy, pain, the mutual support of an exercise community, and the power of human interdependence.

A few things are unsaid in the book that maybe go without saying, such as if you are new to exercise, start slowly and gradually, and if you have any chronic disease or handicapping condition, by all means, have a trainer to get you started, and run it by your health care provider for any precautions or advice.

One thing the author did not address is the question, “Can you get too much exercise?” Most health recommendations say, “moderation in all things.” The people who built the Egyptian pyramids, hauling big rocks up the sides, had reduced life spans. In Traditional Chinese Medicine, when we do excessive stressful things or make excessive demands on the body, we dip into the reserves of energy, and those reserves cannot be replenished. I don’t know of any human activity that, taken to the extreme, is beneficial, especially in a healthful lifestyle. Mostly everything follows a bell-shaped curve. Too little has one effect, more has a different effect, and then much more has a similar effect as too little. For example, a blood pressure of 80/50 is usually not beneficial, or a sign of good health, 110/70 is something like a sweet spot, with best results, and above 140/90 is definitely harmful. I tend to think exercise is also like that, but I find mixed results in the research regarding ultra marathon runners. Some reports show decreased life expectancy, some increased longevity. I would think that Olympic

athletes have much better health than couch potatoes, but maybe poorer outcomes than most other athletes. And we don't know which is cause and effect, better health allowing feats of endurance, or that the endurance makes better health. The overall data is not very clear.

As a whole, this book is a monumental account of how movement, especially with other people, outside with nature, and with music, can transform people's relationship with exercise, and can extend people's health span considerably, reducing most chronic diseases immensely.

I think with this information, we could design a preventive public health program that gives people monetary or other incentives for doing a 6 week exercise class outside, with music, several times per week, the type of exercise tailored to each participant's suitability. My hypothesis is that many people will become "hooked" on how good exercise makes them feel, and they would not want to stop at the end of the program, and will adopt a higher level of movement for their lives indefinitely. This could be incredibly cost effective in improving people's health and lowering medical costs.

This book has many fascinating stories about people finding their "bliss" in a lifestyle of movement. This makes it worth getting and reading the whole book.