Excessive Exercise and Anorexia Nervosa: Addictive and Compulsive Behaviors

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It is a well-established—albeit counterintuitive—fact that many patients with anorexia nervosa (AN) engage in abnormally high levels of physical activity, especially during periods of extreme food restriction. As a consequence, and not surprisingly, most health care professionals have assumed that exercising is simply a symptom of the disorder (i.e., a willful strategy for wasting energy in individuals preoccupied with their weight). However, in recent years we have been obliged to rethink that viewpoint. Evidence from a wide range of sources has clearly demonstrated that excessive exercise has a broad and complex function in the pathogenesis of AN.1-4

Furthermore, in the eating disorders we see, in their extreme form, behaviors that reflect the uneasy relationship that exists between body image and exercise among many women in the general population.

PSYCHOSOCIAL CONSIDERATIONS

Participation in a regular exercise program, especially aerobic activities and weight training, has been implicated in the dynamics of eating-disorder pathology at several different levels. On the one hand, we have evidence that these activities can foster, or exacerbate, a dissatisfaction with the body and a tendency to diet, especially among women with certain psychological vulnerabilities. For example, in a longitudinal study of adolescent girls in Norway, high-level exercise assessed at baseline was one of the strongest predictors of future eating problems.5 It was also reported in a recent study that reading fitness magazines was the only media-exposure variable (from a list that included various types of television programs and printed materials) that correlated positively with symptoms of disordered eating among young women.6 At least in part, findings such as these can be explained by our current cultural obsession with fitness and a thin body type, as well as by the strong media promotion of exercise as a weight-loss strategy.7,8 Moreover, the environment in which exercise often takes place—the mirrored rooms and the skimpy workout attire—contributes to the emphasis on physical appearance rather than physical health.

Competitive female sports and professional dance are also influential in the etiology of disordered eating.9-11 For women engaged in these activities, there is a clear recognition that thinner is faster and lighter, at least up to a point. Slenderness also confers a subtle but powerful advantage in sports that are judged, such as gymnastics and figure skating, and in classical ballet, where this body type is considered more aesthetically pleasing. Indeed, a number of studies have found that female athletes in sports that emphasize leanness are more preoc-
cuptied with their weight and exhibit more patho-
genic weight-loss measures than do female ath-
etles in sports that do not emphasize lean-
ness.12,13

The significance of physical activity in the
risk factor profile for AN has also been con-
firmed by clinical research. Studies that col-
leagues and myself have performed clearly illus-
trate this point. We have consistently found, for
example, that involvement in a competitive
sport or a regular exercise program preceded the
onset of dieting among a large proportion of
patients with AN.14 In addition, a dispropor-
tionately high number of patients with AN
report that they were more physically active
than other girls their age during childhood and
before they ever began to diet.

BIOLIGIC CONSIDERATIONS

In the area of biologic research there is also
considerable evidence, especially from animal
research, of links between physical activity and
low body weight or weight loss. What is particu-
larly interesting is that these relationships
seem to be more pronounced in animals that are
female and that are genetically lean.15 One
example is a syndrome whose behavioral char-
acteristics are remarkably similar to those of
AN patients and that develops among a geneti-
cally lean strain of pigs.16 A substantial number
(estimated to range from approximately 6% to
30%) of the young pigs begin to restrict their
intake of normal food and become hyperactive,
typically during periods of stress (eg, early sep-
oration from the sow). Interestingly, this syn-
drome can be reversed through treatment with
drugs that act on the brain's serotonin (5-HT)
system. Most importantly, however, this syn-
drome occurs mainly in the female pigs.

Another example is the exercise-induced
weight-loss syndrome (also known as "activity
anorexia"). This is a behavioral phenomenon
whereby experimental animals will increase
their wheel running coincident with decreasing
their calorie intake after an initial period of food
restriction. Typically this cycle of behavior con-
tinues and escalates until the animal dies.4 It is
particularly interesting that this process occurs
more consistently in female rats and in strains
that are lean and more reactive to stress.17

There are interesting parallels between the
activity-anorexia syndrome and the behavior of
rats that will press a lever with increasing
rapidity to receive stimulation from an electric
probe inserted in the brain's reward centers.
And, similar to the running, the rats will con-
tinue this behavior to the exclusion of other sur-
vival behaviors such as eating and drinking and
until they drop from exhaustion.18 We can
deduce that running, for the activity-anorexia
animals, has the same reinforcing effect and
therefore must stimulate the same, or similar,
brain neurotransmitter systems as the electric
current to the brain.

There are also striking similarities between
the activity anorexia observed in animals and
the behavior of many patients with AN. We have
consistently found that approximately 80%
exercise excessively during an acute phase of
their weight loss and report that their physical
activity escalated at the same time that their
weight was dropping and they were increasing
their dietary restriction.14,15 We also have evi-
dence that patients with AN who abuse exercise
display more psychological distress and more
psychopathology than do individuals who self-
starve without exercising.15,20

EXERCISE AND ADDICTION

In many species of animals, heightened
locomotion is a behavioral response to stress.
Furthermore, animals that show a high locomo-
tor response to stress (ie, "highly reactive"
animals) display a greater propensity to self-
administer addictive drugs such as alcohol, mor-
phine, and amphetamine than do their less reac-
tive counterparts.21 It is interesting to note that
in human studies, high behavioral activity also
appears to be a susceptibility factor for drug
abuse.22,23

Some have suggested that the self-starva-
tion and excessive physical activity that charac-
terize AN not only mimic other addictive behav-
iors, but should really be viewed as "drug deliv-
ery devices" because both behaviors increase
circulating levels of endogenous opiates—spec-
ifically the beta-endorphins—that activate dopamine in the brain's mesolimbic
reward centers.24,25 As with other addictive
behaviors, many patients report that when the
condition becomes chronic, they continue to self-
starve and to exercise even when they no longer
gain any pleasure from these behaviors and
when the process is painful and exhausting.
Also, both behaviors are highly prone to relapse
after what appears to be successful treatment
and weight restoration.

It has been said that a metaphorical switch
seems to be thrown as a result of prolonged
exposure to any reinforcing activity or sub-
stance, with the result that a behavior that was
once voluntary becomes compulsive and moves
into the state of addiction.26 It is arguable that
the likelihood of this occurring may be greater in
those who display more obsessive–compulsive
traits prior to the addiction. Indeed, there is
indirect evidence for this idea in the fact that
substantial co-occurrence exists among the eat-
ing disorders and obsessive–compulsive disor-
der, obsessive–compulsive personality disorder,
and a variety of addictive behaviors.27–31 There
is also good evidence that a history of affective dis-
orders predate both AN and other addictive
behaviors in a substantial number of individu-
als.32

EXERCISE AND PERSONALITY FACTORS

In a recent study that focused on the per-
sonality risk factors associated with excessive
physical activity in adult patients with eating
disorders, we found support for the associations among obsessionality, addictiveness, and eating disorders. Multiple regression procedures identified that additive personality traits (such as anxiety, anhedonia, and identity disturbance) and obsessive-compulsive personality traits (such as perfectionism, rigidity, and perseverance) were significantly greater in patients with eating disorders who exercised excessively than in their counterparts who did not exercise or who exercised moderately.

These initial results prompted a second study with the purpose of testing a causal model among personality traits, cognitive factors, and behaviors in the development of excessive exercising in AN. We predicted that both addictive and obsessive-compulsive personality traits would increase exercise behavior by fostering more extreme attitudes about exercising. In turn, more intense and frequent exercise would worsen the obligatory attitudes to exercise—a mutually reinforcing cycle that, over time, tends to escalate and to become more and more pathologic. Finally, we predicted that excessive exercising would be more likely to develop in those who were, by nature, very physically active in childhood. Our sample for this study consisted of 84 hospitalized adolescent patients with AN whose mean age was 16 years and whose ages ranged from 12 to 17 years.

A structural equation model was fit to the data in two stages. In the first stage, a multiple regression analysis identified that obsessive-compulsive personality and addictive personality traits simultaneously predicted obligatory attitudes to exercise. In the second stage, logistic regression analysis identified that high childhood activity and obligatory attitudes to exercise predicted the patients who exercised excessively. However, neither obsessive-compulsive nor addictive traits were statistically significant factors in the second model, which supported our prediction that personality influenced exercise behavior indirectly by influencing cognitions about exercise.

Our conclusions from these findings were necessarily cautious because of the cross-sectional and retrospective nature of the data. However, our speculation was that the tendency to be highly physically active, promiscuously, provides the incentive to exercise assiduously in the face of a desire to lose weight. High physical activity may also be a marker of a stress-prone personality. We also proposed that obsessive-compulsive traits describe those who are likely to persevere at a task (in this case, efforts to lose weight by means of dieting and exercise) and that these characteristics may also contribute to increasingly obsessionality about exercising that develop in the face of starvation. Finally, addictive personality traits identify those with a psychobiologic vulnerability for reinforcing behaviors (in this case, exercising) to become increasingly compulsive, and to share the salient characteristics of other addictive behaviors such as tolerance to the rewarding effects, dependence on the activity, and a high likelihood of relapse after treatment.

REFERENCES