

# Does being born low birth weight affect the ability to exercise?

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The prevalence of low birth weight (LBW) in rural and urban areas of India was found to be 26% and 30%, respectively, in a recent study.<sup>[1]</sup> LBW as well as obesity are risk factors for the development of diabetes mellitus (DM), with the thrifty phenotype as a background.<sup>[2]</sup>

Physical inactivity as well as DM appear to be hyper-endemic problems in India. In a recent study,<sup>[3]</sup> it was found that <10% of Asian Indians, living in India, perform any kind of physical exercise. Indian are inactive, which further enhances the risk of obesity, DM, and cardiac diseases. In three states across India, including Tamil Nadu, which altogether have a combined population of 213 million, researchers found that 54.4% of the population was physically inactive. As a rule, men were more active than women and people in rural areas were physically more active than their urban counterparts. Most participants mentioned that they spend their leisure time watching television. The publication estimated that 392 million people in India are inactive and that participants averaged around 19 min of exercise a day.

A smaller study among a South Asian population has shown that there are attitude problems with regard to exercise and the perceptions of them being good for health.<sup>[4]</sup> The obstacles encountered in this study included meager knowledge with regard to the benefits of exercise and negative cultural perceptions about physical activity.

With the thrifty phenotype as a background, are those who were born LBW likely to have a favorable response to physical activity? Cross-sectional data from adolescents involving the study of physical activity patterns and their impact on LBW patients from European cross-sectional databases<sup>[5]</sup> revealed that the physically more active had an attenuation of their insulin resistance

(IR) despite being born LBW. In another cohort study, patients born LBW with glucose intolerance were found to be protected from subsequent DM if they had more physical activity.<sup>[6]</sup>

In the Kuopio Ischemic Heart Disease Risk Factor Study,<sup>[7]</sup> older men were studied with regard to the impact of physical activity depending on their birth weight. It was found that those who were born LBW were subsequently more prone for the negative aspects of the metabolic syndrome. The arguments that have been mentioned above suggest that the responsiveness to physical activity in LBW and its negative impact on prediabetes and DM is inconclusive.

However, conversely, are people who are born LBW less likely to be physically active? Although animal models suggest that this is the case, from a human perspective, a meta-analysis of four studies<sup>[8]</sup> suggests that humans who are born LBW do not have an intrinsic propensity to exercise less and are capable of reasonable physical activity. Very LBW people have been found to have a lower time of participation in exercise, lower frequency, and lower consumption of baseline energy expenditure. In addition, they participate in less leisure time physical activity.<sup>[9,10]</sup>

Bicycles are a common form of transport worldwide. They are cheap and easily available and when used appropriately, they are a good source for exercise and promote mitochondrial biogenesis.<sup>[11]</sup>

Indeed, more recent studies have established quite clearly that in India, the mode of transport commonly used correlates with the components of the metabolic syndrome and the coronary risk factors<sup>[12]</sup> and that walking and bicycling are highly conducive to a substantially healthy metabolic profile.

There has not been any interventional study with controls of bicycle-based exercise in patients who are born LBW

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before we published a study in 2015.<sup>[13]</sup> It seemed to be a logical method which if found to be successful in such a population, may be potentially translated into a public health program.

In this study,<sup>[14]</sup> we assessed the impact of an outdoor exercise intervention on body composition, insulin secretion (IS), and action in young men born with LBW and normal birth weight (NBW) controls in rural India.

Sixty-one LBW and 56 NBW healthy young men were recruited for the study. The participants were instructed to perform outdoor bicycle exercise training for 45 min every day. Fasting blood samples, intravenous glucose tolerance tests, and bioimpedance body composition assessment were performed.<sup>[14]</sup> Physical activity was measured using combined accelerometry and heart rate monitoring during the first and the last weeks of the intervention.

Following the exercise intervention, the LBW participants displayed an increase in physical fitness, level, and total fat-free mass. After intervention, fasting plasma insulin levels, homeostatic model assessment-IS (HOMA-IS) as well as HOMA-IR improved to the same extent in both groups. The study<sup>[13]</sup> indicated that even a relatively moderate duration of intervention had a significant impact on the body composition of the participants. The monitoring of the physical activity and bicycling patterns of the participants were relatively simple, using social workers and patient diaries. To monitor physical activity more intensively with a pedometer or an accelerometer might have been more accurate, though these methods may have limitations as well<sup>[15]</sup> and would never reflect “real life” situations, which was an important aspect of our studies. The humid environments during a greater part of the year precluded the proper contact of the Actiheart device (used to measure heart rate and total energy expenditure)<sup>[16]</sup> on the participants’ chest wall in many situations, and an adequate quantum of data was not available as a result for analysis of the Actiheart output.<sup>[17]</sup> The strength of the study is that it was reality based, considering that bicycle utilization is still fairly common in rural India, hence making it a potentially practical intervention for those who are born LBW.

In summary, while the thrifty phenotype is responsible for postnatal changes that could affect growth,<sup>[18]</sup> it can be metabolically unfavorable.<sup>[19,20]</sup> LBW remains prevalent in India, it is reassuring that exercise may help in preventing the negative long-term effects that may occur in these participants.<sup>[5-8,13]</sup>

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