

## Improving Motivation of Treadmill Exercise for Reducing the Body Weight by Decreasing the Environmental Temperature in a Hamster Model (A Hypothesis)

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### Abstract

**Aims:** The current issue is how to increase the motivation of treadmill exercise in reducing the body weight for those who are less motivated.

**Method:** A hamster model was put into a 0.5 meter diameter treadmill apparatus and motivated with the decreasing environmental temperature by 5 degrees (30-25 °C).

**Result and conclusion:** A temperature drop of 4 degrees Celsius in 73 minutes from 30 degrees Celsius (at 08:57 am) to 26 degrees Celsius (at 10:10 am) has motivated the subject to run at a speed of 73 minutes per 1699 meters or 23.28 meters per minute. A temperature drop of 1 degree Celsius in 102 minutes from 26 degrees Celsius (at 10:10 am) to 25 degrees Celsius (at 11:52 am) has motivated the subject to run at 102 minutes per 3320 meters or 32.55 meters per minute. This means that lower environmental temperatures better motivate the subject to activity than higher temperatures.

**Keywords:** Treadmill exercise; Motivation; Body weight; Environmental temperature; Hamster

### Introduction

Physical inactivity and overweight are growing threats to public health in the developed countries, whereas being overweight regardless of activity level was associated with poor physical functioning and inactivity among the overweight was associated with poor mental functioning [1]. There were evidences about the associations between childhood obesity and mental health. Externalizing behaviors in early childhood were associated with children's weight status early in childhood [3]. There was a finding that the sugar-sweetened beverage (SSB) consumption was positively related to obesity and abdominal obesity [4]. The relationships between obesity and psychological adjustment (reported externalizing and internalizing symptoms) reminded statistically significant [5]. The relationship of body mass index and behavior in children was noted [6]. General motor skill level was lower in obese children than in normal-weight and overweight peers [7].

Past findings shown that among the small species in mammals, a relationship between locomotor performance and body mass was noted [8]. There was a hypothesis that heavy individuals may run more slowly than light individuals because excess mass can be a hindrance to locomotion [9].

In many countries, obesity as a major public health and economic problem has risen to the top of policy and program agendas, with prevention of childhood obesity providing a particularly compelling mandate for action [10]. In human, there was a growing body of scientific literature suggesting that at least 60 min of moderate-intensity physical activity may be necessary to maximize weight loss

and prevent significant weight regain [11]. Physical activity or exercise is easier to quantify and monitor in short experimental studies [12]. Specifically, aerobic exercise has been commonly used to reach weight loss goal [13]. The aerobic physical exercise (like; treadmill walking) for over-weight to obese women with ID (intellectual disability) is a feasible and effective plan in reducing subcutaneous fat mass when performed mild to moderate intensity walking for 25-45 minutes per exercise session, 3-5 times per week up to a weekly walking of 150 minutes, for 32 consecutive weeks [14].

An aerobic exercise program, without hypocaloric diet, can show beneficial effects to reduce visceral adipose tissue with more than 30 cm<sup>2</sup> (on CT analysis) in women and more than 40 cm<sup>2</sup> in men, even after 12 weeks [15]. In mice, exercise improved the lipid profile by reducing body mass gain, insulin resistance, ameliorating the skeletal muscle microcirculation [16]. Another study shown that short-term exercise and low-fat diet consumption cause significant weight loss and altered immune profiles in obese mice with the voluntary wheel running groups lost significantly more body weight as 36% respectively over 8 weeks [17]. The recent finding shown that treadmill exercise (in 8 weeks with 39,4 km of total distance run) reduces non-HDL cholesterol and differentially modulates hepatic and blood PCSK9 (Proprotein convertase subtilisin/kexin type 9) abundance in high-fat-fed C57BL/6 mice [18].

The current issue is how to increase the motivation of treadmill exercise for those who are less motivated? This article was written in order to give an example of how to increase the motivation of treadmill exercise in order to reduce body weight by stimulating environmental temperature decrease in a hamster models based on the assumption that the rise in the ambient temperature had lower job performance [19].

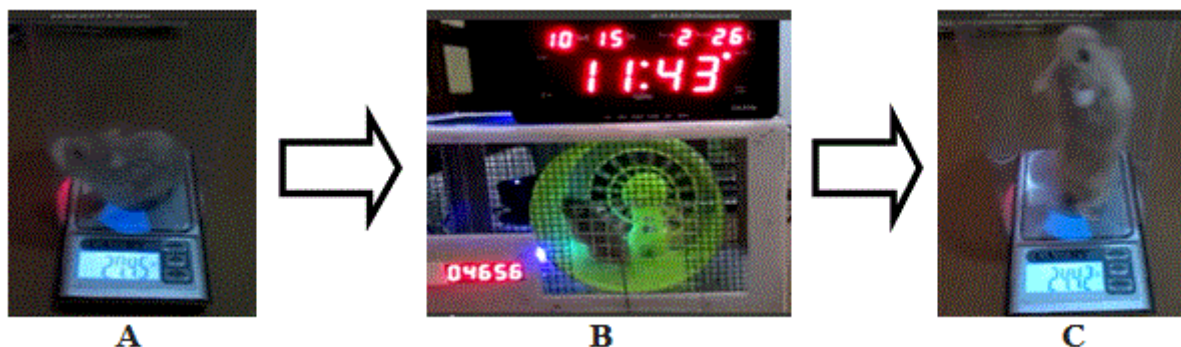
## Method

This research used a single-subject design. A gray-hamster weighed with an electronic scales CAMRY models EHA401 at 8:57 am and 11:52 am. Subject was put into a 0.5 meter diameter treadmill apparatus. A 1 cm metal sensor mounted to detect the rotation treadmill with an indication of addition of nominal figures on a screen of a digital measurement system that was 1 point per 2x round, it means every 2 turns the same as the subject had runed 1 meter (m). COSCO 100 watt lamp used as a light room. A digital camera CANON Power Shot A2300 used to recorded the exercise process. A digital clock digital led Caixing 2158 CX- used to inform environmental temperature changes and the nearest time. Mechanical decrease in

ambient temperature was done by lowering the temperature of the AC (Air Conditioner) to figure capability minimum limit was 16 °Celsius (C). (For the experimental procedures please see below Figure 1 and video as supplementary file).

## Results and Discussion

At pre-test, the body weight was 27.45 gr. Treadmill exercise start from 8:57 am at 30 °C. One minute later (8:58 am) still at 30 °C, the subject runed only as 23 m. When 26 °C (it means that decreasing environmental temperature by 4 degrees at 10:10 am), the subject had runed as 1699 m.

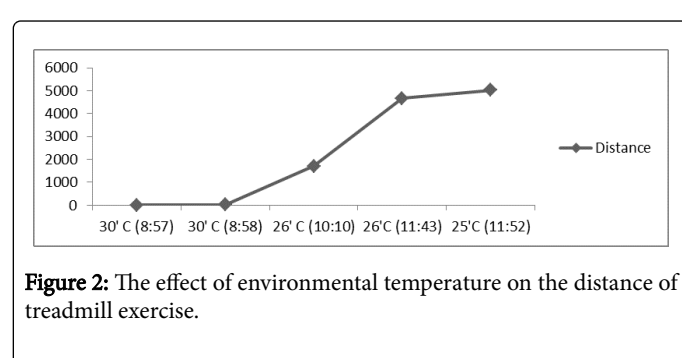


**Figure 1:** Experimental procedures: A) Body weight measurement in pre-treatment, B) Treadmill exercises, C) Body weight measurement in post-treatment.

When 26 °C still present as long as 1 hour and 33 minutes (10:10 am-11:43 am) then the subject had runed as far as 2968 m (4667-1699 m). It means that decreasing environmental temperature by 4 degrees as long as 2 hours 46 minutes (8:57 am-11:43 am) had motivated the subject to run as far as 4667 meters. Then decreasing environmental temperature by 5 degrees (30°-25 °C) had motivated the subject to run as far as 5019 meters for 2 hours 55 minutes (8:57 am-11:52 am) and resulted in a decrease in body weight of 3.03 grams (27.45-24.42 gr). (Please see Table 1, Figure 2 and video as supplementary file).

| Weight (max) | Time     | Temperature (°C) | Distance of treadmill exercise |
|--------------|----------|------------------|--------------------------------|
| 27.45 gr     | 8:57 AM  | 30°C             | 0 m                            |
| 27 gr        | 8:58 AM  | 30°C             | 23 m                           |
| 27 gr        | 10:10 AM | 26°C             | 1699 m                         |
| 27 gr        | 11:43 AM | 26°C             | 4667 m                         |
| 24.42 gr     | 11:52 AM | 25°C             | 5019 m                         |

**Table 1:** The effect of environmental temperature on treadmill exercise and weight.



**Figure 2:** The effect of environmental temperature on the distance of treadmill exercise.

A temperature drop of 4 degrees Celsius in 73 minutes from 30 degrees Celsius (at 08:57 am) to 26 degrees Celsius (at 10:10 am) has motivated the subject to run at a speed of 73 minutes per 1699 meters or 23.28 meters per minute. A temperature drop of 1 degree Celsius in 102 minutes from 26 degrees Celsius (at 10:10 am) to 25 degrees Celsius (at 11:52 am) has motivated the subject to run at 102 minutes per 3320 meters or 32.55 meters per minute. This means that lower environmental temperatures better motivate the subject to activity than higher temperatures.

## Conclusion

These results shown that decreasing environmental temperature could be a useful technique to motivate a treadmill exercise in decreasing body weight for an obesity case.

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