Running wheels systems:Voluntary exercise for mice

We are using the Columbus Instruments Mouse Home Cage Running Wheel which measures spontaneous activity in a voluntary free-spinning running wheel.
There are 16 wheels suitable for 16 singled mice. Each wheel has a magnetic indicator and a hall effect sensor that connects to a computer interface and records wheel revolutions at user-specified intervals.

The running wheels may be used in order to study:
1. Home-cage locomotor activity
2. Differences in mice susceptibility for compulsive behavior (where excess running is considered as a compulsive behavior)
3. Activity- based anorexia (ABA).

Regarding 1 &2- no interference is needed.

3. Detailed description of ABA:
In 1953, Hall and Hanford observed that rats housed with running wheels and subjected to restricted food access for 1 h a day had significant decreases in body weight and food intake, and a paradoxical increase in running wheel activity. This model of "self-starvation" later coined the activity-ABA model, consistently produces rapid decreases in body weight and food intake, hyperactivity, hypothermia, loss of estrus, increases in HPA axis activity, and may leads to stomach ulceration (when weight loss exceeds 30%) and eventually death. Anorexia nervosa is an eating disorder that affects approximately 0.5-1.0% of females during their lifetime and affects about one tenth of as many males. The lifetime mortality rate for AN is approximately 10%, which represents the highest mortality rate of all psychiatric illnesses (Birmingham, 2005).
The ABA model consists of a food restriction period in which animals have access to running wheels. Food intake, body weight, running wheel activity, and survival are monitored daily and compared between groups. Before beginning ABA, mice are acclimated to the experimental equipment and to single housing for 7 days. Typically, most mouse studies to date have used 2-4hs of food access (during the dark cycle) during ABA. Mice are monitored for 5-10 days, those that lose up to 25% body weight are considered anorectic and are immediately removed from the running wheels and allowed ad libitum food access until fully recovered. This model has been broadly used and is fully established and validated in mice and rats (Klenotich and Dulawa, 2012).
For ABA model, food restriction is mandatory in order to observe the increased activity.

The experiment will start with an habituation period on which daily food intake will be measured. At the first day of food restriction, food will be weighted at the beginning of the dark phase and will be weighted and removed following 4h. If an animal consumed less than 1.5g, a pre-weighted food pellet will be left in the cage. Food will be given at the beginning of the next dark phase and will be available for 4h. Again, if an animal consumed less than 1.5g, a pre-weighted food pellet will be left in the cage.
During the next few days food will be available for 4h/d.
%food restriction will be calculated by dividing the food consumed in 4h by the daily

food intake before beginning the ABA protocol. If the restriction is higher than 75%, the time in which the food is available will be gradually shortened.
A control group will be singly housed and fed by the same regime without the presence of the running wheels.

Mice will be evaluated for 5-14d. Mice usually develop ABA during 5d. It may be interesting to monitor mice which will not develop ABA for up to 14d, looking at their coping strategies.

The general locomotor pattern will be monitored on a daily basis and be used as an indices of well-being.
The mouse body weight will be monitored twice a week.In case of ABA protocol the body weight will be monitored daily.Daily food consumption will be monitored.

No side effects are expected.
When using ABA protocol: weight reduction is expected. the experiment will be stopped upon 25% weight loss and the animal will be moved to a cage without a running wheel with ad libitum access to chow diet.