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Research Paper

Social Isolation and Wheel Running

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Introduction

In the laboratory, rats stay individually and with the groups as well, like humans. Would the housing influence their daily life? Many decades ago, housing among laboratory rats were found to have an effect on the health and behaviors as exercise. (Wiberg and Grice, 1963; Korn and Moyer, 1968) Social isolation, as studies, has impact on humans like feeling lonely, tendency to have mood disorders like depression to pressure- related chronic conditions like heart disease and so forth. More severely, they are more vulnerable for health issues. Loneliness can be a marker for major health problems and mobility problems; feeling of vitality, less energy and feeling tired more often, more frequent bouts of sickness, such as colds or flu, longer recovery time period, decrease level of happiness and satisfaction causing no hope for living and even shorter life spans. I think the issues that were studied that happened on humans could also happen on rats. It is also important to know how much we should care about the housing on the impact of health especially how isolation could influence one's physical health.

This is why I wanted to do my own research to see whether or not if social isolation has an effect on wheel running for rats. My dependent variables would be the amount of exercise as purpose to see isolation versus group housing.

Method

Subject

Five experimentally naïve, all male rats, Sprague- dawley for the specie, obtained from the Neuroscience Department lab in Allegheny College, and approved by Allegheny College Institutional Animal Care and Use Committee Protocol. Upon arrivals, age range from 5-7 months and weight between around 386-520g. 15 days period of wheel running and 7 days of separation and grouping of the housing, housed in animal vivarium of 12 hours light-dark cycle with temperature-controlled room. Food and water were freely available in the home cages. Rats were checked daily for the health condition, food and water and the cages were cleaned every other day. The rats were marked with green, red, purple and black for the colors on the tails in order to distinguish. All rats for the test were stored in pairs in cages in the basement of Psychology Department.

Apparatus

Five metal running wheels from company of Wehmann, Baltimore, MD were used to measure the rotations of exercise, they are all standard rodent running wheel with holding cages, counting a single rotation. Wheel rotations are measured by the numbers of circles, which shows on the apparatus on the counter as numbers. When the solenoid is activated, a rubber-tipped metal shaft contacts the wheel, making the wheel to stop gradually. The bar is mounted on a metal plate that fits over the entrance to the wheel. The number shows on the counter were recorded before and after the test, then take the finished rotation numbers to subtract the begin numbers and get the rotations they run. Later on, average the numbers across the rats and compare that day to day. There is a retractable lever underneath that contains the waste from the rats and got cleaned after the test. The equipment was located in a separate room so that there was no disturbance during the test. During the test, the light was provided in the room.

Procedures

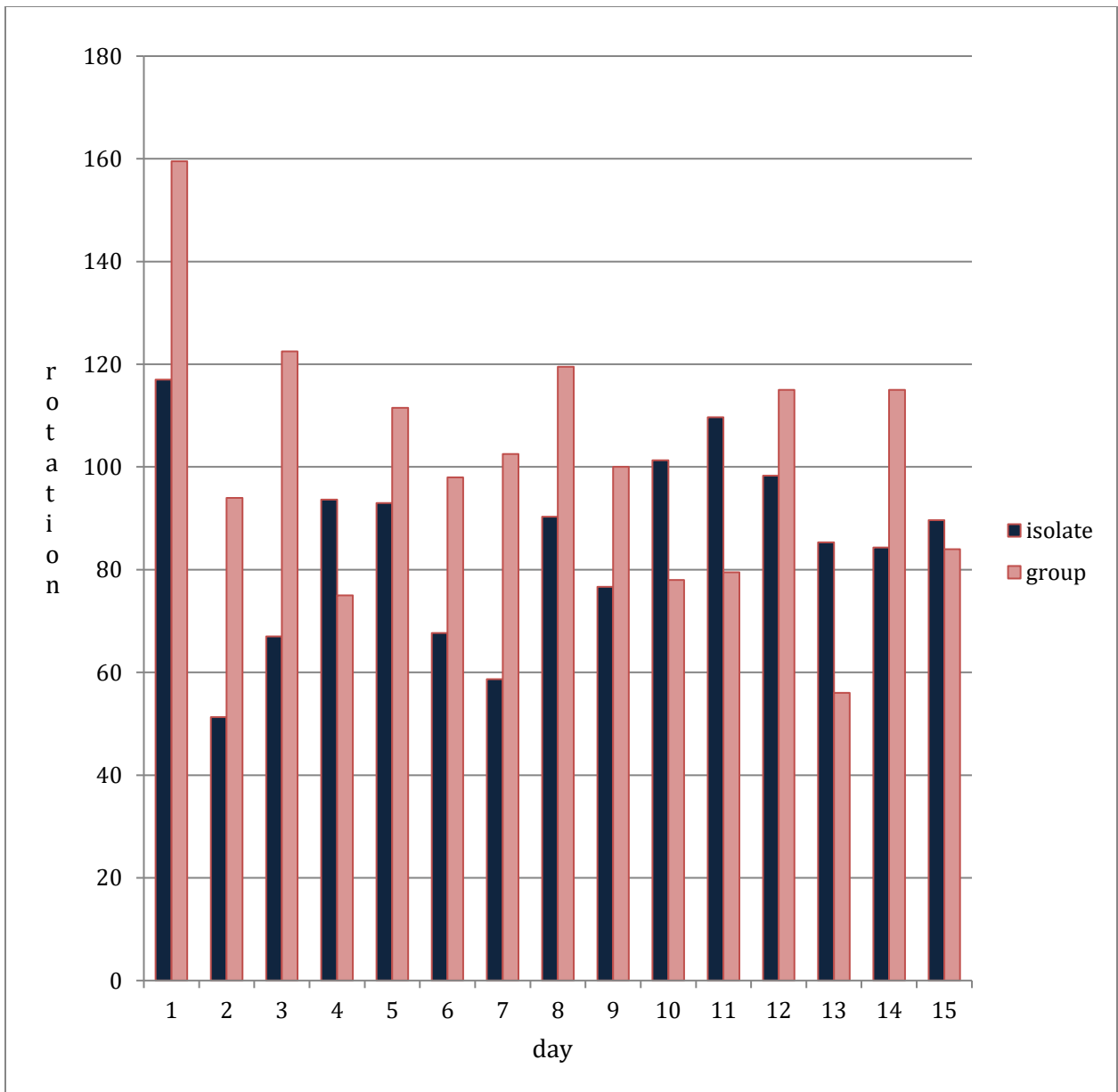
This experiment has been done by Leasure and Decker in 2009 before. I did the repeated method but different gender, manipulation and topic. The 5 rats were set on the wheel for running with daily access without forcing for 3 hours at about the same time around 4:00-7:00pm including weekends, which was adequate time. The rats were given exercise and then returned to the home cage. The 5 rats were divided into two groups- isolated-housed group and group-housed group. 3 out of 5 were isolated group and the other 2 were group-housed ones. The experiment started on 4/1/2015 and ends on 4/15/2015. Once everything was set up, a note for the avoidance of disturbance was put

on the door before I left the room. In order to get an idea of their general weights and health condition after housing, I did a pilot study for one-week period prior to the experiment. Before the actual experiment, I weighted them at about the same time everyday and noticed that all of their weight dropped the first few days and then came back a little day by day especially the group housing ones. Two from the isolation group were sick for a few days during the test. Antibiotics were given to the sick ones if noticed. The amount of exercise was anticipated to increase day by day and the isolated group was expected to run less than the group-housed ones. After the test, I measured their body weight again. For almost every one, they lost 10g after the 3 hours test every time. However, their body weight was about the same in comparison to their usual weight around the same time everyday before the experiment. Their health condition was checked very carefully daily to insure that there's no severe health decline and more seriously, signal of dying. There was a form for health, water and food and cleaning conditions to fill out in the lab daily and was checked by the supervisor. By continuing the process, collect the notes and average the numbers to get the number between isolation group and group-housed group. The independent variables were the hours of exercise and group housing for 2 levels- isolation and group housing. The dependent variables were weight and rotations they ran.

Results

There were some interesting differences between the 2 groups of rats noticed. As observed, the isolated rats were slightly calmer when I opened their home cage in comparison to the grouped rats, the grouped ones were more excited, they ran around the cage and climbed or grabbed the cage, whereas the isolated group had no attempt to leave the cage but resisted less than the grouped ones. When I put them together in one cage before I took them to the lab, the isolated ones seemed to stay closer and desiring more to stay together than the grouped ones. What's more, when I was feeding them with peanut butter while the 5 of them were stored altogether, the grouped ones seemed to be more active and came over to the spoon immediately when I was holding. The isolated ones whereas seemed to be more careful and hesitated to come over to the spoon until a few days until they got comfortable. While I was weighting them, the isolated group was also more calm and the grouped ones were knocking on the cover and trying to get out. For the wheel running, in the graph, for the first day of wheel running for the rotations on average, the grouped ones ran 159.5, whereas the isolated group ran 117, and the second day is 94 versus 51.3, day 3 is 122.5 versus 67, day 4 is 75 versus 93.67, day 5 is 111.5 versus 93, day 6 is 98 versus 67.67, day 7 is 102.5 versus 58.67, day 8 is 119.5 versus 90.3, day 9 is 100 versus 76.67, day 10 is 78 versus 101.3, day 11 is 79.5 versus 109.67, day 12 is 115 versus 98.3, day 13 is 56 versus 85.3, day 14 is 115 versus 84.3 and day 15 is 84 versus 89.67. Thus, what the graph told me is that for the 10 days out of 15 days that the grouped ones ran more than the isolated ones, which are day 1, day 2, day 3, day 5, day 6, day 7, day 8, day 9, day 12 and day 14. The days that the isolated group ran more than the grouped ones included the situation that one of the grouped ones was sick. On day 2 and 7, the isolated group seemed to run a lot less the former days was because

the red one was sick and only ran 28 rotations, that's why the average was brought down a lot. In general, the group-housed group on the task of wheel running is slightly more consistent than the isolate-housed group. On the first day, they all seemed to run much more than the latter days and then started dropping drastically and then became both consistent. They didn't run more and more day after day as expected, instead there's flowing fluctuation.



Discussion

The results seem consistent with the reference data that investigated the effect of social isolation with wheel running. Exercise is both decreased in the isolated groups and the isolated groups seemed to be less excited on any activity. (Leasure & Decker, 2009)

But the difference I noticed in my group that was evident was that the isolated groups got sick more often than the grouped ones and took longer to recover as well. The weights were all consistent. I expect to see more interesting pattern if this experiment were to be carried out for extended four weeks. Also, I wonder how the results would be if this were carried out on female rats. According to the past studies, female rats were more preferable of crowding than isolation and that they were more vulnerable to the effect of isolation. I wonder if female rats would run less and become sick more often than male rats. What's more, I would like to see if the isolated group would regain more exercise if they were put altogether again as a grouped-housed group after we already see the pattern of difference for isolation. Generally, the data suggests that the housing condition does affect exercise.

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