

# Effects of Exercise on Reproduction in Budgerigars

(*Melopsittacus undulatus*)

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In the National Research Council's Guide for the Care and Use of Laboratory Animals (1972), exercise is defined as "any physical activity." The purpose of this research is to determine the effect of physical activity on the reproductive system.

The need for exercise to maintain good general health has been described for several animals including rats (Farris, 1954), rabbits (Sawin, 1954), opossums (Farris, 1954), and monkeys (Wagnen, 1954), although Pope indicates that it is not necessary in lizards (1954). Dawson states that female cats "do not become sexually receptive when confined to cages," and that males should also be allowed "considerable freedom of movement" (1954).

The budgerigar (*Melopsittacus undulatus*) was chosen for the experiment since it is a psittacine and closely related to all parrot-like birds. Some parrot-like birds are difficult to breed and observations from budgerigars may be cautiously applied to other psittacines.

The need for exercise in psittacine breeding programs is well reported in guides and handbooks. Curtis stresses the need for flight room and exercise in breeding cockatiels (*Leptolophus holandicus*; 1963). Rogers addresses the need for exercise specifically for budgerigars, stating that they need to fly "if they are to get their needed exercise and be in condition to breed" and that allowing more space "keeps them in top condition for longer periods" (1970). He recommends that a breeding cage be at least three feet long for a single pair. For the lovebird (*Agapornis spp.*), another small psittacine, Bielfeld recommends a cage 48" x 36" x 24" per pair and states that poor hatchability and cage vices may result from "inadequate living conditions" (1982).

One explanation for the need for exercise is that it is essential for the relief of stress. Snyder (1975) lists restricted movement as a possible stressor and suggests that birds may respond to stress with a decrease in reproductive function and that chronic functional disturbances may develop when reactions to stress "cannot be extinguished by the release of physical activity" (1975).

The purpose of this experiment, funded by the University of Illinois College of Agriculture Undergraduate Research Program, is to determine the specific effects of exercise on reproductive success and to quantify these effects.

## PROCEDURE

The experiment started with fifteen pairs, divided into three groups of five

Table 1

FEEDING SCHEDULE								
Date	Fresh Food	Avitron	Date	Fresh Food	Avitron	Date	Fresh Food	Avitron
2- 5	_____	_____	3-25	cabbage	X	5-13	_____	X
2- 6	_____	_____	3-26	carrot	_____	5-14	eggs (2)	X
3- 7	_____	_____	3-27	egg (1) w/shell	X	5-15	carrot	_____
2- 8	celery	_____	3-28	green beans	_____	5-16	cabbage	X
2- 9	_____	_____	3-29	lettuce	X	5-17	_____	_____
2-10	carrot	_____	3-30	egg (1)	_____	5-18	lettuce	X
2-11	_____	_____	3-31	cabbage	_____	5-19	broccoli	_____
2-12	eggs (2)	X	4- 1	green beans	X	5-20	corn	X
2-13	_____	_____	4- 2	lettuce	_____	5-21	Carrot	_____
2-14	carrot	_____	4- 3	egg (1) w/shell	X	5-22	eggs (2)	X
2-15	_____	_____	4- 4	carrot	_____	5-23	peas	_____
2-16	_____	X	4- 5	lettuce	_____	5-24	carrot	X
2-17	_____	_____	4- 6	spinach	_____	5-25	green beans	_____
2-18	eggs (2)	_____	4- 7	carrots	_____	5-26	eggs (2)	X
2-19	_____	_____	4- 8	egg (1) w/shell	_____	5-27	cabbage	_____
2-20	green beans	X	4- 9	green beans	_____	5-28	peas	X
2-21	_____	_____	4-10	cabbage	_____	5-29	carrots	_____
2-22	_____	_____	4-11	carrot	_____	5-30	green beans	X
2-23	carrot	X	4-12	egg (1)	_____	5-31	egg (1)	_____
2-24	green beans	_____	4-13	green beans	_____	6- 1	peas	X
2-25	_____	_____	4-14	lettuce	_____	6- 2	cabbage	_____
2-26	_____	_____	4-15	egg (1) w/shell	X	6- 3	carrot	X
2-27	_____	_____	4-16	green beans	_____	6- 4	egg	_____
2-28	banana	X	4-17	cabbage	X	6- 5	apple	X
2-29	_____	_____	4-18	egg (1)	_____	6- 6	carrot	_____
3- 1	_____	_____	4-19	carrots	X	6- 7	eggs (2)	X
3- 2	lettuce	_____	4-20	cod liver oil	_____	6- 8	carrot	_____
3- 3	_____	_____	4-21	_____	_____	6- 9	dandelion	X
3- 4	Lettuce	_____	4-22	_____	_____	6-10	eggs (2)	_____
3- 5	_____	_____	4-23	cabbage	X	6-11	_____	_____
3- 6	egg (1)	_____	4-24	eggs (2)	_____	6-12	_____	_____
3- 7	dry greens	X	4-25	_____	X	6-13	_____	_____
3- 8	egg (1)	_____	4-26	carrot	_____	6-14	eggs (2)	X
3- 9	spinach	_____	4-27	green beans	X	6-15	carrot	_____
3-10	_____	X	4-28	cabbage	_____	6-16	dandelion	X
3-11	_____	_____	4-29	eggs (2)	X	6-17	peas	_____
3-12	egg (1)	X	4-30	green beans	_____	6-18	eggs (2)	X
3-13	peas	_____	5- 1	peas	X	6-19	carrot	_____
3-14	cod liver oil	_____	5- 2	eggs (2)	_____	6-20	dandelion	X
3-15	cabbage	X	5- 3	green beans	X	6-21	eggs (2)	_____
3-16	egg (1)	_____	5- 4	lettuce	_____	6-22	carrot	X
3-17	carrot	X	5- 5	eggs (2)	X	6-23	dandelion	_____
3-18	egg (1) w/shell	_____	5- 6	carrot	_____	6-24	eggs (2)	X
3-19	cod liver oil	X	5- 7	cabbage	X	6-25	carrot	_____
3-20	cabbage	_____	5- 8	lettuce	_____	6-26	dandelion	X
3-21	egg (1) w/shell	X	5- 9	eggs (2)	X	6-27	eggs (2)	_____
3-22	carrot	_____	5-10	_____	_____	6-28	carrot	X
3-23	cod liver oil	X	5-11	_____	X	6-29	dandelion	_____
3-24	egg (1)	_____	5-12	_____	_____	6-30	eggs (2)	X

pairs each. One female in each group had been placed in a breeding colony once, but it is not known whether she had actually bred. All the remaining birds were virgin stock ranging in age from six to twenty-one months. Pairs were assigned to groups of equal age and relative size; size was determined visually.

The birds were housed by pairs in cages measuring 16" x 13" x 8". They were fed a parakeet seed mixture, supplemented with fresh food and vitamins. A summary of the feeding program is described in table 1. Cuttlebone, grit and water were always available.

Each group was given a different exercise program. The conditioning period lasted twenty-seven days for all groups.

Group I birds were permitted no exercise during the conditioning period but were removed daily from the individual cages and put together in a holding cage (22" x 12" x 15") for two hours as a control for social interaction and handling. One female of this group died during this period, leaving four pairs and a lone male.

Group II birds were also removed to a holding cage, identical to the first, but were released into the room after one

hour. They were allowed flight and frequently encouraged to fly by walking toward them, causing them to fly to the other end of the room. They were caught again in the dark, and returned to their cages. Although this was not a daily routine (there were days missed) they averaged approximately fifty minutes of freedom per day for a total distance of about 300 feet per bird.

Group III birds were immediately released into the room and allowed freedom for two hours. They were then caught in the dark and returned to their individual cages. Including the days missed, they averaged 100 minutes of freedom per day for a total flight distance of about 585 feet per bird.

Estimates of flight were made by determining the average number of flights across the room per hour and multiplying this by the length of the

room and the number of hours (See Appendix A).

After the conditioning period was over, nest boxes were provided for the birds and exercise was discontinued. This minimized disturbing the birds any more than necessary, but caused a problem since many of the birds took a long time to begin nesting.

Data were then collected daily by checking the nest boxes and weighing all young.

## RESULTS

The original protocol of the experiment presented several problems. The first was that many of the birds had already lost condition when they finally laid eggs. This could negate the effects of the conditioning. Secondly, many of the pairs simply did not nest. However, there were some differences in the

## Appendix A

### Calculations of Amount of Exercise

#### 1. Total number of minutes of flight:

Group I: 0  
Group II: 1365  
Group III: 2725

#### 2. Total number of hours of flight:

Group I: 0  
Group II: 22.75  
Group III: 45.42

#### 3. Number of flights per hour (average of four one-hour counts):

66.75 flights/hour

#### 4. Length of flights (distance across room):

7.5 m

#### 5. Distance flown per hour (3 x 4)

500.625 m

#### 6. Total distance flown (2 x 5)

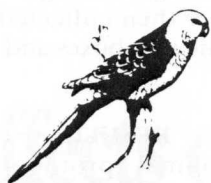
Group I: 0  
Group II: 11.389 m/bird  
Group III: 22.738 m/bird

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productivity of the exercised birds compared to the idle birds.

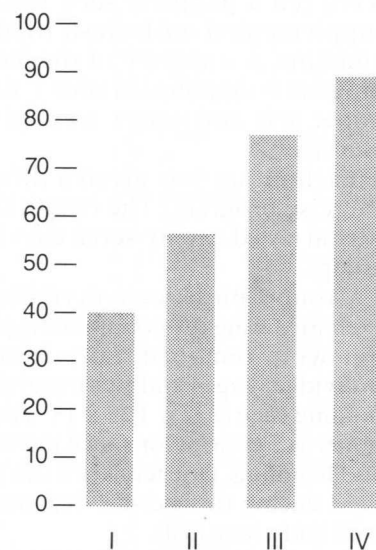
The most significant difference between the exercised and non-exercised groups was the hatching percentage. Although the birds in the group exercised for two hours per day during the conditioning period, they had a lower hatching rate than the one hour group, the exercised groups as a whole had a much higher hatching percentage than the non-exercised group (58.5% as opposed to 42.9%) (figure 1).

Although three week total nest weights (average number of young/nest at 3 weeks x average weight of young at 3 weeks) of the exercised group was lower than the idle group, the total nest weights at one week and at two weeks were slightly higher for the exercised group (figure 2).

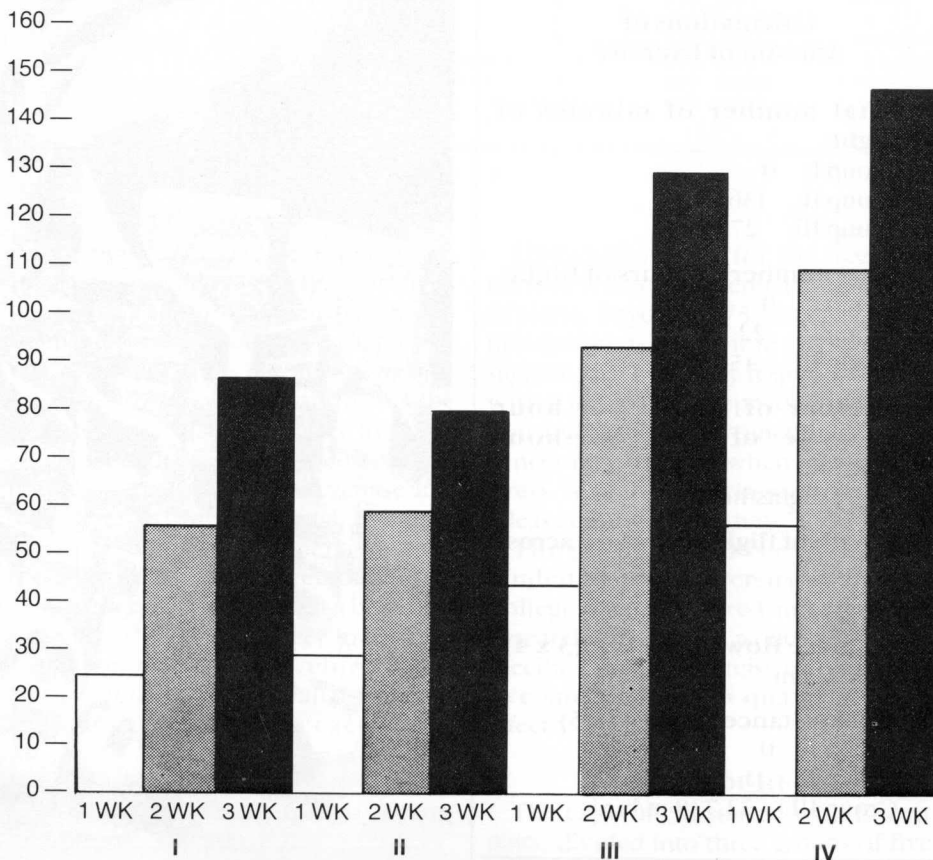
Since only seven of the fifteen pairs nested under the conditions described in the procedures, it was decided to see how the birds would fare if allowed liberty in the room. Within thirty-two days of their release, every pair had started to nest and many had started a second clutch. The productivity

**Figure 1**  
**Hatching Percentage**

Group	Exercise Program
I	No exercise allowed
II	Conditioned 1 or 2 hours/day for 27 days
III	Liberty* 24 hours/day for (less than 10 days before 1st egg)
IV	Liberty* 24 hours/day (> 14 days before 1st egg)



**Figure 2**  
**Total Nest Weight**  
(Average Weight x Average No. of Young)



(hatching percentage and total nest weight) was markedly better than either the non-exercised group or the conditioned and caged group.

With this change in protocol, groups were redefined. Group I is the same as defined previously in the original procedure; Group II now includes both Group II and Group III of the original procedure; Group III now includes all pairs which produced an egg before ten days after release; Group IV includes all pairs which produced an egg fourteen days or more after release.

Group III had a higher hatching percentage and total nest weight than either Group I or Group II but a lower hatching percentage and total nest weight than Group IV. This was true for the total nest weights at one, two and three weeks.

Group IV showed the highest productivity presumably because they had a longer period to attain condition than any of the other groups.

A summary of hatching percentages and total nest weights is shown in figures 1 and 2.

### CONCLUSIONS

Since many factors, such as social interaction and a "sense of freedom," can influence the birds' readiness to breed, the fact that the birds quickly went to nest when released cannot be entirely attributed to exercise.

This experiment indicates some reproductive parameters are influenced by physical activity. The total weight of young produced, as well as the hatching percentage, are substantially improved by exercise. This is in agreement with the reported experiences of many bird breeders although most agree successful breeding is possible in even the small cages such as those used in this experiment.

In summary, these data indicate exercise is beneficial, if not necessary, for breeding budgerigars. This is something breeders of budgerigars should consider when trying to improve hatching or growth.

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