

**Supplementary material**

**Appendix 1.****Table A1.** Ingredients of hand-made egg yolk-coated millet fed to the nutrition group.

	Amount		%
Husked millet		800 g	83.9
Egg yolk	4	72 g	7.5
Salt	1 teaspoon	6 g	0.6
TetraMin	3 teaspoons	5 g	0.5
Dried crucian powder	9 teaspoons	15 g	1.6
Honey	20 cc	28 g	2.9
Powdered milk	9 teaspoons	15 g	1.6
Soy bean flower	2 teaspoons	2.2 g	0.2

**Table A2.** (a) Dietary composition was estimated based on pecking times for each food menu (i.e. seed mix, dry vegetable, canary seed, egg yolk-coated millet, and rice) during a one hour observation of foraging behavior of each subject bird in the experimental group. Specifically, on the middle day of food treatment, each bird was individually introduced into a cage equipped with five food cups containing each of the above five food menus after one hour food deprivation, and the number of pecking times at each food cup was counted through video recording. The percentages given in (a) show the proportion of pecking counts to each food / total pecking counts. (b) Nutritional intake was then calculated for either when they consumed 100 g of normal food (1) only, or when they consumed 100 g of normal and extra nutrition food (1)+(2), at the proportions shown in (a). For instance, calorie intake of (1)+(2) for bird BF0007 was estimated on 60.6 g seed mix, 2.4 g dry vegetable, 12.4 g canary seed, 13.5 g coated millet and 13.5 g rice, which was compared with calorie intake from the same amount of (1) that was supposedly composed of 96.2 g seed mix and 3.8 g dry vegetable (60.6 : 2.4 = 96.2% : 3.8%). Nutritional ingredients were taken from nutrition facts of each product or the Japanese Standard of Dietetic Information. A Wilcoxon signed-rank test was conducted to examine if each nutritional ingredient intake was higher for (1)+(2) compared with (1) only.

Bird ID	(a) Dietary composition					(b) Estimated nutritional intake per 100 g normal food (1), or 100 g normal + extra-nutrition food (1)+(2)																	
	(1) Normal food		(2) Extra-nutrition food			Calorie		Protein (g)		Fat (g)		Carbohydrate (g)		Phosphorus (g)		Vitamin D (µg)		Vitamin E (mg)		Vitamin B1 (mg)		Vitamin A (mg)	
	Seed mix	Dry vegetable	Canary seed	Coated millet	Rice	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)	(1)	(1)+(2)
BF0007	60.6%	2.4%	12.4%	13.5%	13.5%	362.3	374.0	10.6	12.0	3.3	4.0	70.6	69.0	0.28	0.31	0.00	0.12	0.23	0.35	0.10	0.20	0.10	0.08
BF0008	22.4%	0.4%	20.1%	31.0%	26.4%	363.7	368.9	10.3	12.4	3.2	4.5	71.7	65.3	0.27	0.31	0.00	0.28	0.24	0.51	0.10	0.27	0.05	0.04
BF0016	37.8%	0.0%	18.2%	5.6%	38.5%	365.0	365.0	10.0	11.2	3.2	3.9	72.7	67.3	0.27	0.27	0.00	0.05	0.24	0.34	0.11	0.23	0.00	0.00
BF0018	81.0%	0.5%	9.3%	1.0%	8.8%	364.6	368.2	10.1	11.0	3.2	3.5	72.3	70.4	0.27	0.29	0.00	0.01	0.24	0.25	0.10	0.16	0.02	0.01
BF0022	73.1%	0.0%	8.3%	10.2%	8.3%	365.0	366.5	10.0	11.0	3.2	3.7	72.7	69.9	0.27	0.29	0.00	0.09	0.24	0.32	0.11	0.17	0.00	0.01
BF0024	46.6%	0.0%	39.7%	11.2%	2.6%	365.0	378.1	10.0	14.8	3.2	4.4	72.7	63.1	0.27	0.39	0.00	0.10	0.24	0.24	0.11	0.34	0.00	0.01
BF0025	40.7%	21.8%	6.8%	36.4%	16.1%	340.3	428.8	15.2	16.6	4.1	5.6	53.4	71.8	0.37	0.41	0.00	0.33	0.16	0.55	0.07	0.20	0.97	0.63
BF0026	17.9%	0.0%	30.8%	12.8%	38.5%	365.0	369.3	10.0	12.8	3.2	4.4	72.7	64.0	0.27	0.32	0.00	0.12	0.24	0.37	0.11	0.31	0.00	0.01
BF0027	46.0%	2.0%	0.7%	19.3%	34.0%	362.0	365.7	10.7	10.1	3.3	3.9	70.4	70.5	0.28	0.24	0.00	0.17	0.23	0.48	0.10	0.15	0.12	0.07
BF0020*	0.0%	0.0%	0.0%	32.6%	67.4%	-	354.2	-	8.9	-	4.2	-	68.4	-	0.19	-	0.29	-	0.67	-	0.18	-	0.03
<b>Average</b>	<b>42.6%</b>	<b>2.7%</b>	<b>14.6%</b>	<b>17.4%</b>	<b>25.4%</b>	<b>361.4</b>	<b>373.9</b>	<b>10.8</b>	<b>12.1</b>	<b>3.3</b>	<b>4.2</b>	<b>69.9</b>	<b>68.0</b>	<b>0.28</b>	<b>0.30</b>	<b>0.00</b>	<b>0.16</b>	<b>0.23</b>	<b>0.41</b>	<b>0.10</b>	<b>0.22</b>	<b>0.14</b>	<b>0.09</b>
<b>Wilcoxon signed-rank test</b>						<b>&lt;</b> <b>p = 0.014</b>		<b>&lt;</b> <b>p = 0.007</b>		<b>&lt;</b> <b>p = 0.009</b>		p = 0.164		p = 0.107		<b>&lt;</b> <b>p = 0.009</b>		<b>&lt;</b> <b>p = 0.014</b>		<b>&lt;</b> <b>p = 0.004</b>		p = 0.156	

\*Bird #BF0020 did not consume normal food.