

Induction of a social differentiation in human groups submitted to an experimental situation based on the rodent diving-for-food model

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Introduction

In nature, many forms of organization have been observed in animal societies in response to an environmental constraint. Many mammal species adapt to the constraint by developing a complex and flexible system of social behaviors. This requires the implication of a kind of cognition named the social cognition that allows to everyone to construct mental representations of other members of the social group, as well as of the relations between them. Knowledge of this web of relations is essential for the expression and adaptation of individual behavior. In rodents, the diving-for-food model is an experimental situation that is suitable to provide a large set of information for studying the implication of this type of cognitive processes in the social organization of groups faced to an environmental constraint. This is a model in which the food accessibility is made difficult by progressively immersing the only way of access with water, leading to the emergence of a behavioral differentiation in groups of rats faced with this constraint [1, 2, 3]. To be more precise, a single food source is located at the end of an aquarium, so that rats have to dive and swim under water to get the food, and they have to go back to the cage where congeners are present, to eat it. In these conditions, a behavioral differentiation based on social interactions appears between Carrier rats which dive and bring the food back to the home cage, and the Non-Carrier animals which never dive and obtain their food by stealing it from the other members of the group. The present communication will describe the experimental situation, the procedure and the behavioral characteristics of a human model that consists of a transposition of the rodent diving-for-food model in every respect.

Material and methods

The transposition of the diving-for-food model in humans is therefore directed towards a playful aspect. Thus, the aim of this experimental situation is the hoarding of points by each participant within a group of 6 players. The points consist of small light plastic crosses (2 g) issued in bags of forty units. They can be obtained in two ways: either by overcoming a motor skill task, or by "stealing" them to their partners after a confrontation through a strategy game. The final appropriation of the points is effective when crosses have been introduced into the slot lid of a plastic box, each player having its own box. The experiment presented as a game seems to be an element of motivation enough for everyone because all participants have made the different tasks proposed to get points.

Experimental situation

The experience takes place in a 20 m² room within a delimited area divided into 3 different areas: the area of the motor skill task, the area of the strategy game, and the area of individual boxes. The experiment is presented as a game which reveals the purpose, the rules and the different elements of the game.

The only way for introduction of the points into the game is to win to the individual motor skill task. Each participant have to wade through a wire spiral (1.20 m long composed of 9 spires

of 4 cm in diameter) with a metal ring and to avoid contact with the wire. A bell reports any failure. In the event of success the subject receives a bag of 40 pieces, i.e., 40 points.

The second solution to get points is to challenge one of a subject who holds a packet of points through a strategy game named "Power Play 4", and if succeed in, to obtain the bag with the points it contains from the holder. This game requires cognitive abilities to develop strategies more or less effective and can compensate for a failure to the motor skill task.

Procedure

The experimental study of one group of 6 subjects includes 4 sessions of 30 minutes each, interspersed with periods of 15 minutes of rest. During the first 4 sessions, the number of spires to wade progressively increased from 1 at the first session to 9 at the last one in order to improve the difficulty to get points. The 5th session is a replica of session 4: it is designed to verify the stability of the social organization of the group.

Behavioral scoring

As for rats in the diving-for-food model, behavioral items related to the hoarding of points are scored. A first set of variables assesses the performance of each subject (number of points in the box at the end of the session, total number of hoarding points). A second set of items is related to the appropriation of the points (time of point possession at the box, number of periods of possession ending with the exhaustion of the points). The third one corresponds to the way of getting points (number of attempts and number of success to the motor skill task, number of point thefts they committed, number of challenges for stealing points). Finally, the fourth set of items is related to the loss of points (number of point thefts they experienced, number of challenges for protecting points). Behavioral data are analyzed by means of principal component analysis in order to identify the statistical dimensions around which behaviors are organized. Then, individuals are classified into groups of similar behavioral profiles by means of a hierarchical agglomerative cluster analysis of Euclidean distances using Ward's method.

Results and perspectives

The results obtained from all the groups tested until now [4] show the emergence of a behavioral differentiation in 3 different profiles as in the rat diving-for-food model. The Non-Carrier subjects never succeeded in the motor skill task and have to get their points by stealing it to the holders. The two other profiles correspond to the Carriers. They present some abilities for getting points through the psychomotor task and can be separated into two subtypes based on their efficacy in protected their points in the strategy game. The more efficient participants are designed as the Autonomous and the less ones as the Suppliers. This model in humans could represent new perspectives to better understand the interactions between individual and social factors that lead a subject to adapt to his social environment.

References

1. Colin, C.; Desor, D. (1986). Behavioural differentiation in groups of rats subjected to a difficulty of access to the food. *Behavioural Processes*, **13**, 85-100.
2. Krafft, B., Colin, C.; Peignot, P. (1994). Diving-for-food: a new model to assess social roles in a group of laboratory rats. *Ethology*, **96**, 11-23.
3. Schroeder, H., Desor, D. (2005). The behavioural differentiation between the Carrier and the Non-Carrier profiles in groups subjected to the diving-for-food situation: a complex social model to study anxiety in rodents. *Proceedings of Measuring Behavior 2005, 5th International Conference on Methods and Technics in Behavioural Research (Wageningen, August 30-September 02, 2005)*, 390-393.
4. Toniolo, A.M. (2005) Résolution de problème individuel en situation collective : une dynamique complexe à l'épreuve de l'expérimentation. *Revue Européenne de Psychologie Appliquée*, **55**, 29-42.