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Effects of consequences on patterns of interlocked contingencies; A replication of a metacontingency experiment

Efectos de las consecuencias sobre los patrones de contingencias entrelazadas: una duplicación de un experimento metacontingencial

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Ana Carolina Trousdell Franceschini,
Mariana Januário Samelo,
Rodrigo Nunes Xavier,
Maria Helena Leite Hunziker
University of Sao Paulo, Brazil

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Rua Maria Bucalem Haddad, 100 ap. 31, Sao Paulo, SP. Brazil. 04125-010. E-mail: ana.franceschini@usp.br
Universidade de São Paulo, Instituto de Psicologia, Departamento de Psicologia Experimental, Avda. Prof. Mello Morais, 1721, BUTANTÃ 05508-900 - Sao Paulo, SP – Brasil. E-mails: masamelo@gmail.com, rodrigonunesxavier@gmail.com, Hunziker@usp.br

Resumen

El concepto de Metacontingencias le fue enseñado a estudiantes de licenciatura de psicología utilizando una simulación propuesta originalmente por Vichi, Andery y Glenn (2009). Veinticinco estudiantes distribuidos en tres grupos fueron sometidos a seis sesiones experimentales en los que harían apuestas y dividirían las ganancias obtenidas. Los tres grupos compitieron entre sí por cantidades definidas de fotocopias. Fueron utilizadas dos contingencias durante las sesiones. En la contingencia B, el grupo ganaría puntos únicamente si durante la rodada anterior todos los miembros recibiesen un número de puntos igual entre ellos. Bajo la contingencia A, las ganancias eran referentes a la distribución desigual de puntos entre los miembros del equipo. Se observó la predominación de divisiones proporcionales independientemente de la contingencia en vigor. La manipulación de las consecuencias culturales (ganancia o pérdida de puntos) produjo cambios consistentes en las dos categorías de respuestas: (1) elección de los valores apostados en cada ronda y (2) división de los resultados de cada ronda entre los miembros. Las relaciones de

Abstract

The concept of metacontingency was taught to undergraduate students of Psychology by using a "game" simulation proposed originally by Vichi, Andery and Glenn (2009). Twenty-five students, distributed into three groups were exposed to six experimental sessions in which they had to make bets and divide the amounts gained. The three groups competed against each other for photocopies quotas. Two contingencies shifted over the sessions. Under Contingency B, the group would win points only if in the previous round each member had received the same amount of points and under Contingency A, winning was contingent on an unequal distribution of the points. We observed that proportional divisions predominated independent of the contingency in course. The manipulation of cultural consequences (winning or losing points) produced consistent modifications in two response categories: 1) choices of the value bet in each round, and 2) divisions of the points among group members. Controlling relations between cultural consequences and

control entre las consecuencias culturales y el comportamiento de dividir fueron estadísticamente significativas en uno de los grupos, mientras que en los otros dos grupos estas relaciones de control se observaron solamente ante la contingencia B. Se sugiere la revisión de los criterios de refuerzo propuestos por el experimento original.

Palabras clave: Contingencias Entrelazadas, Metacontingencias, Contingencias Culturales, Conducta Social.

the behavior of dividing were statistically significant in one of the groups, whereas in the other two groups controlling relations were observed only in Contingency B. A review of the reinforcement criteria used in the original experiment is suggested.

Key-words: Interlocking Contingencies, Metacontingency, Cultural contingencies, Social Behavior.

Skinner´s (1981) proposal that behavior is determined by three levels of selection – phylogenic, ontogenic and cultural – did not generate a systematic treatment regarding the third level until 1986, when Sigrid Glenn began to conceptualize and analyze such relations and called them "metacontingencies". Since then, this concept has evolved through several reformulations creating a research field focused on developing a theoretical basis under the behavioral analytical approach to support the study of cultures and social groups (Andery, Micheleto & Sério, 2005; Andery & Sério, 2001; Glenn, 1988, 1991, 2003, 2004; Glenn & Malott, 2004; Malott & Glenn, 2006; Todorov, Moreira & Moreira, 2005). The present article adopted the metacontingency concept proposed by Martone and Todorov (2007) which states that it is "the relation between a group of interlocking behavioral contingencies (IBC) and the effects caused in the environment by such interlock" (p.184).

Despite the fact that metacontingencies deal with a different type of selection focused on groups they do not involve any behavioral process other than those already known in the control of individual behavior. This area's contribution to the contingency concept is the description of relations which affect not only the individuals' behavior, but also interlocking behavioral contingencies (IBC) which produce broader consequences for groups of individuals. The notion of interlocking behavioral contingencies is based on the idea that in the social environment those stimuli and responses that are part of individual contingencies tend to interlock with other people's contingencies and become stimulus for new responses. The consequences of these interlocks are called "cultural consequences", emphasizing the effects on the survival or evolution of the whole cultural group. Therefore, the study of metacontingencies focuses on controlling relations of the environment over IBCs. Controlling relations occur when the probability of a given event is changed due to the occurrence of a preceding one (Hunziker, 2003). If the occurrence of a cultural consequence alters the probability of an interlock, there might be a controlling relation between the two events.

In pursuit of creating experimental equivalents of cultural practices in the laboratory, Vichi (2004) and Vichi, Andery and Glenn (2009) investigated if the interlocking behavior of individual members of a group could be modified by the manipulation of cultural consequences. Two groups of four undergraduate students were submitted to nine experimental sessions, in which they took part in a game. The participants were placed in front of an 8x8 matrix (columns and rows) in which the cells showed "+" and "-" signs in equal proportions and randomly distributed. The subjects received chips that could be exchanged for money by the end of the session. The rounds started with the participants individually betting the chips, by placing them in a bet box. The group would then have to collectively choose a row number (1-8) after which the experimenter would pick a column, following a criteria unrevealed to the participants. If the intersection of row and column showed a "+" sign, the experimenter would double chips bet; if the result was a "-", the experimenter would extract half of the chips in the bet box. After that, the participants had to deposit some of the chips to a 'savings' box (collective decision) and divide the remaining chips among the members. By the end of the experiment, the participants in each group would have to collectively decide how to distribute the "savings" among members. Occasionally, the experimenter could define the amount of chips to be saved in a round.

The experimenter's column choice was based on how the chips were divided among members in the previous trial, equally or unequally. The pattern of equal or unequal divisions among group members (considered an IBC)

was the dependent variable. Two contingencies changed throughout the experiment: under condition A the "+" sign was contingent on equal chip division in the previous trial. Condition B imposed the opposite criteria, that is, the "+" sign would be chosen by the experimenter if the division of the previous trial resulted in unequal amounts of chips returning to the participants. Contingencies A and B were reverted after ten consecutive winnings. The groups were exposed to both contingencies, but in reverse order: one began under condition A and the other under condition B.

The results showed that both groups had their collective behavior of dividing the chips controlled by the manipulated contingencies, that is, divisions that produced the "+" sign became more frequent. The authors concluded that these results "can be taken as an indication that social practices are constructed as groups of social contingencies under control of their consequences" (Vichi et al., 2009, p. 68). These results were not replicated in posterior studies. Lopes (2010) pursued a direct replication of this experiment whereas Martone (2008) introduced several alterations in the original procedure. In both, the earnings of the "game" did not select or maintained the interlocked behavioral contingencies.

Given the importance of the investigative proposal made by Vichi et al. (2009), a new replication of this procedure was conducted to examine if, despite the differences between the studied groups, the experimental variables manipulated would select collective behaviors (IBCs). It was attempted to maintain as much as possible of the characteristics of the original procedure in order to produce a systematic replication (cf. Sidman, 1960/1976). However, a few differences were inevitable due to the higher number of participants here manipulated and to the fact that this study was conducted among the regular activities of an undergraduate course.

Method

Participants

25 undergraduate Psychology students participated in the experiment, 14 females and 11 males with ages ranging from 17 to 38 years-old. All the participants were taking the course called Experimental Analysis of Behavior II (EAB II).

Equipments

A colored matrix, composed of eight rows and eight columns, was used. The intersections contained "+" and "-" signs, in equal proportion, randomly distributed. It was printed in A4 size paper, analogous to the one used by Vichi (2004) (Figure 1). Colored plastic chips similar to the ones used in poker games were used six aluminum boxes (18x10x5cm), registry sheets, three stop watches and one video recorder.

	blue	orange	red	green	purple	yellow	white	brown
1	+	-	+	-	-	+	-	-
2	+	+	-	+	+	-	+	-
3	-	-	-	-	+	-	+	+
4	+	-	+	-	+	-	-	+
5	-	-	-	+	-	+	+	-
6	-	+	+	-	+	-	+	+
7	-	+	-	+	+	-	-	-
8	+	+	+	-	-	+	-	+

Figure 1: Matrix with eight columns and eight rows numbered from 1 to 8, with equal quantity of + and – signs randomly distributed among the cells.

Procedure

The students´ participation was considered part of their EAB II course, and their presence in each session resulted in 0.25 points added to their grades from the practice part of the course. The students were divided into three groups (n= 8 or 9) and placed in separate rooms. Each group worked with one experimenter and an assistant who were course monitors. All students read and signed a free consent form to participate in this activity.

The rooms contained chairs distributed around a table, on which the matrix was placed, two boxes (one for the bets and another for the "savings"). In one of the rooms there was a video recorder placed on a wall, framing the table and the participants. The experimenters and assistants remained in the rooms during the whole time of the sessions.

The groups were named G1, G2, and G3 (G1 and G3, n=8; G2, n=9), and submitted to six consecutive sessions,

one per week. In the first session, the following instructions were read out loud by one of the experimenters:

"The research will be conducted in seven sessions of approximately 1 hour and 30 minutes, in which three groups will participate. It consists of a game on a matrix of 8 columns and 8 rows, that form cells containing a + or – sign in each, randomly distributed. At the beginning of the first session, each participant will receive chips that are worth 110 points to be used in bets. By the end of the session, the amount of chips that remain with each player will belong to him/her and will accumulate for the next session. At the beginning of the round, each participant will have half a minute to individually decide how many points he/she will bet (minimum of 3 and maximum of 10). The chips will be put in the betting box and, summed up, will compose the group bet. Then, the group will have half a minute to choose a row in the matrix. After the group choice is announced, the experimenter will reveal a column that was determined by a previously determined criterion, to which only she/he has access. If the intersection between row and column presents a + sign, the group will receive double the points bet; if it presents a – sign, they will lose half of the amount bet. A share of this amount received by the group has to be deposited in a box called Savings. In some moments of the game, the experimenter will decide the number of points to be saved. The remaining points have to be distributed among the players, who have the liberty to decide how to do it. If this distribution is not done in one minute and a half after the savings deposit, the points in the box will belong to the experimenter. After this, a new round will begin. The session will last 30 rounds or 2 hours, whichever comes first.

The content of the Savings will belong to the players at the end of the last session. The group that achieves the highest amount of points at the end of the game will have its Savings doubled. It is up to the group to decide how these points will be divided among its members. After the end of the experiment the points will be exchanged for photocopies at the college service.

One of the members of the group ("dealer") will be designated to register the bets and choices made by the participants in each round in a specific sheet, as well as the earnings obtained, how they were distributed and the amount of points that each participant possesses at the end of the session."

Two experimenters (main and assistant) attended each experimental session, timing each round and registering four response classes: individual bets (choices of number of chips bet), collective choice of the row number, collective choice of savings (quantity deposited in the "savings") and type of divisions (whether the chips were divided equally or unequally among the participants). As per the instructions, "bet" was considered a response class and named R1; the other registered responses were considered as interlocked behavioral contingencies, and named IBC1 (row choice), IBC2 (saving choice) and IBC3 (divisions).

Each participant was responsible for his/her chips and bets. If a subject lost all his/her chips during the game, this had to be manage by the group who could loan chips or make any other arrangements that would allow the colleague to continue playing. If a participant missed a session, his/her chips were stored until his/her return.

All groups were exposed to six experimental sessions. The first round of the experiment produced a "+" sign. After that, the column choice made by the experimenter was contingent on IBC3, that is, to the type of division chosen by the participants on the previous round: in contingency A, the "+" sign was contingent on an equal division (all members receiving the same number of points) and in contingency B to a different division of the chips (at least one participant receiving a different amount of points). If this criterion was not met, the round would produce a "-" sign. If the total of bet chips was an odd number, the experimenter rounded up the earning in order to benefit the group.

G1 and G2 began the experiment in contingency A, and G3 in B. The contingencies changed after five rounds with consecutive "+" signs. After two contingency changes, this criterion was raised to ten consecutive "+" signs. If there was five consecutive rounds with "-" signs, the experimenter would intervene by defining the amount of points to be deposited in the "savings", in order to increase the probability of a division that attended the operating contingency. The intervention in "A" would leave a residual amount of points that was a multiple of the number of participants, increasing the chances of an equal division; in "B", the residual points were never a multiple of the number of participants, which guaranteed

that at least one participant, would receive a different number of points. When the experimenter registered high frequencies of winnings or losses due to "superstitious" strategies (verbally reported by the participants), she/he would intervene further to expose the participants to the programmed contingency.

The competition among the groups was established in order to increase the reinforcement value of the chips.

Results

Figure 2 shows the effect of IBC3 (dividing responses) in terms of accumulated wins (production of "+" on each round). Every time the participants produced a "+" sign by choosing the correct division, one point is added to the line, whereas "-" signs are represented by steady lines. The small vertical traces along the line of cumulative wins mark the rounds in which the experimenters intervened on the "savings" deposit; the contingency changes are signaled by the line that vertically divides the figure.

The dividing response (IBC3) changed as a function of the operating contingency. However, each groups needed different exposure time under the contingency before reaching the contingency changing criterion. The comparison between G1 and G2, both beginning in contingency A, shows that while G1 reached this criterion in the middle of session 3, G2 only reached it at the middle of session 5; consequently, G2 remained less time exposed to contingency B and the experiment ended without showing controlling relations under this contingency. The comparison between G1 and G3 shows that the pattern of IBC3 controlled by one contingency interfered with the subsequent pattern controlled by the opposite contingency. Contingency B (reinforcement of different division) produced a high frequency of reinforcement when it was first presented to the group, but this frequency was reduced in subsequent presentations after Contingency A (especially in the last occurrence of B).

There was also a difference in the number of rounds necessary to adjust after the contingency inverted: G1 showed a pattern of successive reduction of adjusting time to the current contingency, while G3 showed variable durations in successive phases A and B. Despite these differences the IBC3 pattern (types of divisions) was modified by the operating contingency in all three groups.

The visual inspections which supported these analyses are not fully confirmed statistically. Considering that only two possible dividing responses were permitted (equal or unequal), the verification of contingency control over these responses depends on the confirmation that the correct responses proportion was above 50%. In G1, the total proportion of correct divisions after each winning round was 63.4% ($Z=2.43$; $p=0.008$). This higher proportion was confirmed in both contingencies (Contingency A: 60.4%, $Z=2.07$ $p=0.019$; Contingency B: 67.7%, $Z= 2.89$ $p=0.002$). In G2 and G3 the proportion of "+" signs subsequent to winnings was 58.0% and 55.1% respectively, but they were not statistically superior to 50% considering $\alpha=0.05$ (G2: $Z=1.44$, $p=0.074$; G3: $Z=0.91$, $p=0.182$). Controlling relations of earnings over division responses were confirmed for both G2 and G3 under contingency B (G2: $Z=2.42$, $p=0.007$ and G3: $Z=2.92$, $p=0.002$). However, statistical significance was not reached when they were under contingency A.

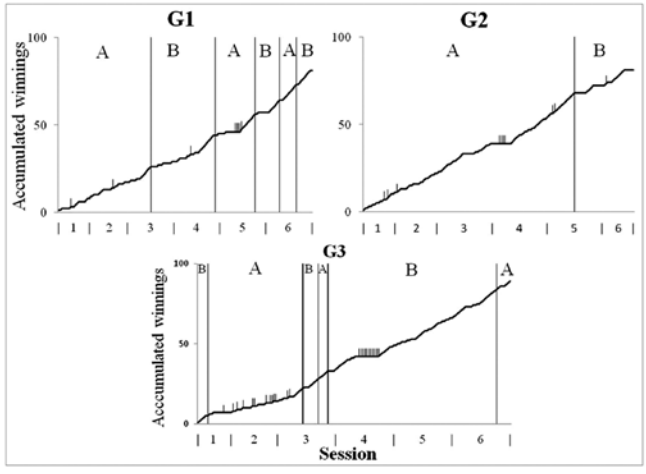

Figure 2: Cumulative records of winnings ("+") along the sessions under contingencies A and B. The small vertical traces on the winnings line mark the rounds in which the experimenter intervened by defining the "savings".

Although IBC3 refers to only two types of chips divisions ("equal" or "unequal") to which consequences were applied, some groups adopted a third division pattern: proportional. Proportional divisions are those that meet at least one of the following criteria:

(1) If the participant bet more points than the others and at the end of the round received more points than the other participants;
(2) If the participant bet less and received less than the others;

(3) If, after eight or nine rounds (depending if the group was composed of eight or nine participants) the sum of the individually-received points was identical for all participants. This criterion was established due to some groups having agreed that only one point would be deposited as "savings", and that this point would be taken from one of the participants. In the subsequent round, the "saved" point would be taken from another participant, thus leading to a "rotation" system. With this strategy, by the end of eight or nine rounds, all participants would have received equal points, maintaining a proportional division.

Proportionality for each round can be seen in Figure 3. The intertwining lines in the first few sessions show that all groups started with indifferent patters towards proportional or non-proportional divisions. In G1 and G3, the proportional pattern became predominant from the third session on. G2 showed a predominance of non-proportional divisions until the final sessions. Since the order of exposure to the contingencies was similar for G1 and G2, a functional relation between the proportionality of the division and the operating contingency cannot be identified. However, the pattern shown by most of the groups suggests that the contingency might have affected IBC3. By manipulating the individual bets (R1) some groups maintained a pattern of proportionality at the same time they complied with the criterion of the running contingency (A or B). If a group consistently bets unequal amounts and divide them unequally (i.e. proportionally), the reinforcement criterion of contingency B would be met, whereas to comply with Contingency A the participants can bet equal amounts and divide them equally (thus, proportionally). So, by coordinating individual bets (R1) the groups may produce high reinforcement frequencies under both contingencies through the selection of a third type of IBC3: proportional.

The standard deviation among individual bets (R1) for each round is presented in Figure 4. A high standard deviation indicates that for that round the participants bet different points among themselves; a low standard deviation indicates that all members bet the same number of points in that round. The three groups differed in that account. Groups G1 and G2 varied between similar or different bets, whereas G3 adopted a stable pattern of identical bets from the third session on with exception to only one round in session 5.

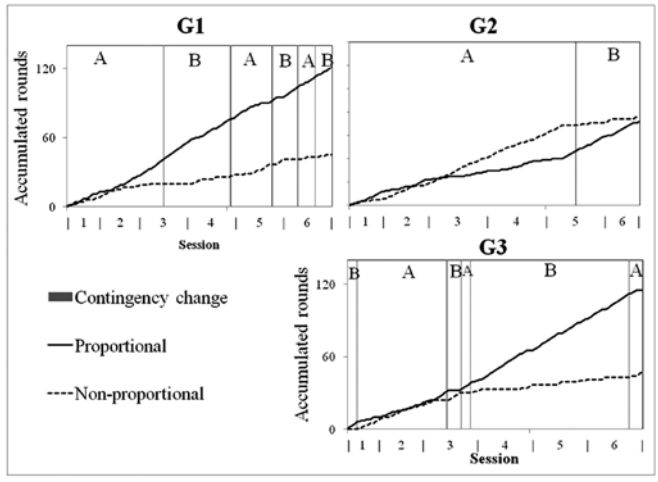

Figure 3: Cumulative frequency of proportional and non-proportional divisions over the six experimental sessions. The vertical line indicates contingency changes (A and B).

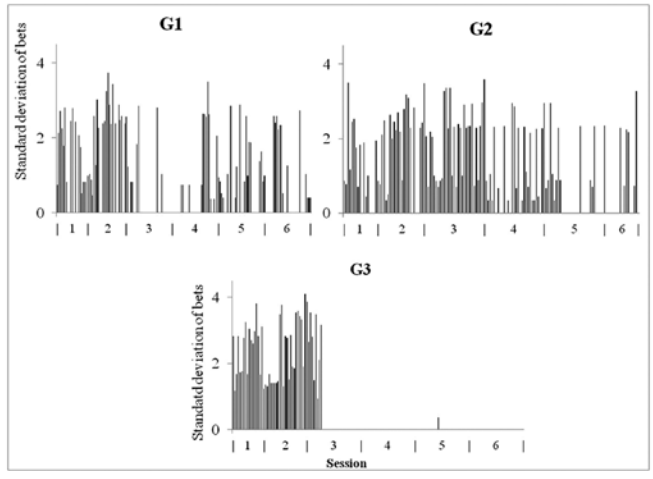

Figure 4: Standard deviation of the bets (R1) in each round.

Figure 5 shows the sum of individual bets (R1) for each group (lines) and the rounds that presented wins (bars under the lines). Winnings clusters (several bars together) and losses clusters (blocks of empty space) are observed, as well as moments of intermittence of wins and losses. Apparently there were correspondences between wins/losses and the amount bet, which increased after the third session. In G1 and G2 the winnings were intermittent until the first half of the third session, being accompanied by erratic bets. In G3, the beginning of the first session shows that a winning cluster occurred at the same time as an increase of points bet, being succeeded by a period of intermittent winnings and inconsistent bets. The beginning of Session 4 shows an increase in winnings

and bets, followed by a reduction in bets accompanied by losses on the middle of that session. In the second half of Session 5, a winning cluster occurred at the same time as an increase of points bet. A similar correspondence occurred in Session 5 of G2.

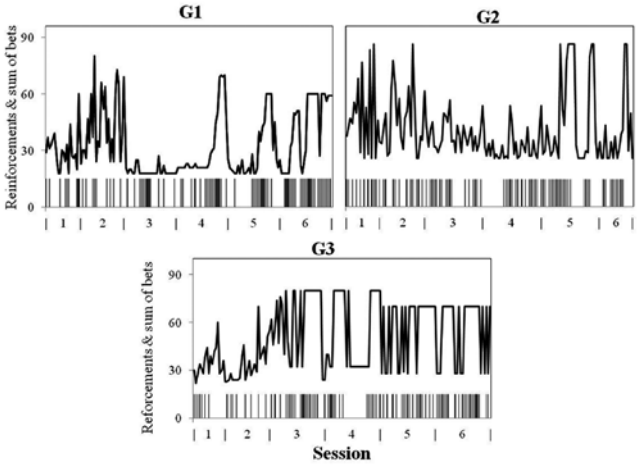

Figure 5: Total points bet (lines) and consequences of winnings (bars).

Both IBC1 (row choice) as IBC2 (savings) apparently were not consistently affected by the manipulated contingencies. It can be reported in informal terms that in Session 1 the participants searched for relations between the row number and winnings, which is compatible with the fact that IBC1 occurred immediately before the column announcement, which in turn generated wins or losses. Therefore, probably due 0 to contiguity, this was the first response that was scrutinized in the search for the reinforcement criterion. However, the participants rapidly abandoned this approach and sought other behaviors that possibly generated the gains. The analysis of IBC2 was obstructed by the experimenter's interventions on savings.

Discussion

Results showed direct effects of reinforcement over IBC3 and indirect effects over R1. Two effects were observed in IBC3. If, as in Vichi et al (2009) and Lopes (2010), the study considers only if successive gains reached the criterion for contingency change, then we can state that the data here obtained replicated the ones from Vichi et al. and disagree with the ones from Lopes, since all groups reached these criteria. In this sense, the contingencies here manipulated established control over collective behaviors, being an experimental analogous to metacontingencies.

However, the statistical analysis did not confirm the establishment of control by Contingency A, only by contingency B. Since Vichi et al. (2009) and Lopes (2010) did not conduct such statistical treatment, the comparison cannot be made. This data suggests that this procedure needs to be refined in order to obtain reliable analogous of metacontingencies with all the implemented contingencies. Since it is a group design, this analysis demands a demonstration that the differences are statistically significant.

The instructions establish R1 (bet choice) as an individual response, while the other categories are considered collective. However, the individuality of R1 was not confirmed during the procedure: standard deviation of bets decreased, in general, as the experiment went on, that is, the bets became gradually more similar among members of the group. More informally, the video recording showed that verbalizations such as "how much are you betting?" became more frequent. Also, some participants followed the orientation of a "leader", suggesting that the betting responses may have become collective, or an IBC.

The combination of Figures 3 and 5 (changes obtained in IBC3 and R1, respectively) provides support for an alternative hypothesis for how and which kind of controlling relations were established by this procedure. Figure 3 shows a "standardization" tendency of the bets and a selection of proportional divisions of the round results throughout the experiment. The participants´ behavior may have been under control of both earning points and maintaining an equal status among group members. In our society, there is a rule that a "fair" earning should be proportional to risks taken: it is culturally considered "fair" that if someone risks more (ex: bets more), that person should earn more if the choice was correct (since losses would be higher if the choice was incorrect). Since the participants of this study maintained social contact outside the sessions, it is possible that part of their dividing responses occurred under control of this cultural rule, balancing the bets ("risks") and compensation (earnings in the division). This process was informally observed in verbal phrases such as "I bet more than you, so it is fair that I receive more".

Another possibility is that the stability of social intra-group relationships could have been regulated by the competition condition. If a member of one of the groups felt that the division was "unfair", the group could be

weakened by more fragile social relationships and become less competitive towards the others. It may be interesting to investigate if the contingencies established by this experimental procedure would be strong enough to regulate non-proportional choices among the participants, even if they can be considered "unfair". For this, the suggestion would be to replicate this study using proportional or non-proportional divisions as IBC3.

Some modifications of the original procedures could have partially influenced the results. One was the quantity of points received by the participants at the beginning of each session. In the procedure conducted by Vichi et al. (2009) and followed by Lopes (2010), the participants received 110 points at the beginning of each session. That is, the winning and losing consequences of each session remained restricted for that session without extensions to the others. In the present study this amount was received only in the first session, whereas in the following sessions the participants began with the chips remaining from the previous ones. This produced a continuous exposition of the participants to the effects of their previous decisions. This difference may have altered the consequence magnitude manipulated by the experimenter. Even though Vichi et al., obtained the effects of the established contingencies, it is possible that this effect could be more potent if the procedure adopted here was used.

A second procedural change was the gradual increase in the criterion for contingency change, from five consecutive wins in the first three changes, to ten consecutive wins thereafter. Both Vichi et al. (2009) and Lopes (2010) used the criterion of ten consecutive wins since the beginning of the experiment. However, the effect of this change is not clear since the results were not systematic for all groups. On the one hand, this condition could have promoted a gradual learning and also the exposure of all participants to both contingencies. But on the other hand, it could have made the control by the manipulated contingencies more difficult since, as shown in G3, the strengthening of a division pattern made learning the opposed pattern more difficult. Thus, more studies need to be conducted to verify if the gradual increase in contingency change requirement is, in fact, a critical variable of this experimental design.

As a matter of fact, because of the reinforcers used, the exchange of chips for photocopies at the end of the study seemed to have had little effect in maintaining the students engaged in the task, despite the a priori assumption that this exchange could be reinforcer. Participants seemed to be more motivated by the "intellectual challenge" of trying to discover the reinforcement criterion, and the fact of "winning points", especially in a group-competing environment. Therefore, the competition condition should be maintained in future studies as a way to increase the points´ reinforcement value, without the need to exchange them for other materials.

Finally, it is worth noting that this experiment was a stimulating didactic tool. The students voluntarily met after the sessions to hypothesize on possible experimental criteria, compare their groups´ performances in the competition, and define strategies for the sessions. This experiment engaged them in the practice activities of the course and apparently amplified their interest in the theoretical part which suggests that it was a highly appropriate auxiliary instrument in teaching Behavior Analysis.

References

Andery, M. A. P. A. & Sério, T. M. A. P. (2001) O conceito de metacontingências:Afinal, a velha contingência de reforçamento é insuficiente? In R. A. Banaco (Org.), *Sobre comportamento e cognição: Aspectos teóricos, metodológicos e de formação em Análise do Comportamento e Terapia Cognitivista* (pp. 105-115). Santo André: ESETEC.

Andery, M. A. P. A., Micheletto, N., & Sério T. M. A. P. (2005). A análise de fenômenos sociais: esboçando uma proposta para a identificação de contingências entrelaçadas e metacontingências. *Revista Brasileira de Análise do Comportamento*, *1*(2), 149-165.

Glenn, S. S. & Malott, M. (2004). Complexity and selection: Implication for organization change. *Behavior and Social Issues, 13*, 89-106.

Glenn, S. S. (1986). Metacontingencies in Walden Two. *Behavior Analysis and Social Action, 5*, 2-8.

Glenn, S. S. (1988). Contingencies and metacontingencies: Toward a synthesis of behavior analysis and cultural materialism. *The Behavior Analyst, 11*(2), 161-179.

Glenn, S. S. (1991). Contingencies and metacontingencies: Relation among behavioral, cultural, and biological evolution. In P. A. Lamal (Ed.), *Behavioral Analysis of Societies and Cultural Practices*. Reno, NV: Hemisphere Press.

Glenn, S. (2003). Operant contingencies and the origin of cultures. In K. A. Lattal & P. N. Chase (Eds.), *Behavior theory and philosophy* (pp. 223-242). NY: Kluwer Academic/Plenum Publishers.

Glenn, S. S. (2004). Individual behavior, culture and social change. *The Behavior Analyst, 27*, 133-151.

Hunziker, M.H.L. (2003). Sobre Controle em *Desamparo Aprendido*. Tese de Livre Docência, Instituto de Psicologia, Universidade de São Paulo, São Paulo.

Lopes, E. B. (2010). *An experimental analog of a cultural practice: Effects of a contingent aggregated outcome, but not contiguous, on interlocking contingencies of reinforcement*. Master´s degree dissertation. Belém: Universidade Federal do Pará.

Malott, M. & Glenn, S. S. (2006). Targets of intervention in cultural and behavioral change. *Behavior and Social Issues, 15*, 31-56.

Martone, R. C. & Todorov, J. C. (2007). O Desenvolvimento do Conceito de Metacontingência. *Revista Brasileira de Análise do Comportamento, 3*, 181-190.

Martone, R. C. (2008). Efeito das conseqüências externas e de mudanças na construção do grupo sobre a distribuição dos ganhos em uma metacontingência experimental. Tese de Doutorado em Ciências do Comportamento, Universidade de Brasília, Brasília.

Sidman, M. (1960). *Tactics of scientific research: evaluating experimental data in psychology*. New York, NY: Basic Books.

Skinner, B. F. (1981). Selection by consequences. *Science, 213*, 501-504.

Todorov, J. C. & Moreira, M. B. (2005). O conceito de motivação na psicologia. *Revista Brasileira de Terapia Comportamental e Cognitiva, 7*(1), p. 119-132.

Vichi, C., Andery, M. A. P. A., & Glenn, S. S. (2009). A Metacontingency Experiment: The Effects of Contingent Consequences on Patterns of Interlocking Contingencies of Reinforcement. *Behavior and Social Issues, 18*, p. 1-17.

Vichi, C. (2004). *Igualdade ou desigualdade em pequeno grupo: um análogo de manipulação de uma metacontingência*. Dissertação de Mestrado, Instituto de Psicologia, Pontifícia Universidade Católica de São Paulo, São Paulo.