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1 Contingency management treatments for drug use

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Drug addiction is a major health problem. Approximately 27 million people have substance use disorders worldwide (UNODC, 2015). This high prevalence places a heavy burden on public health systems and society as a whole. The total cost associated with substance abuse in the United States alone exceeds $700 billion per year, including costs related to health care, crime, and work productivity losses (National Institute on Drug Abuse, NIDA, 2016).

The past 50 years of research have produced compelling evidence that drug use is subject to operant conditioning laws (see Higgins, Heil, & Lussier., 2004 for a review). This chapter focuses on the description of a behavior analytical approach to treatment that has come to be known as **contingency management (CM)**. In this approach, the target behavior — abstinence from drug(s) — is objectively monitored, and reinforced with tangible reinforcers contingent upon its verification. A meta-analysis comparing the efficacy of all psychosocial treatments concluded that contingency management had the largest effect size of all psychosocial therapies in treating substance use disorders (Dutra, Stathopoulou, Basden, Leyro, Powers, & Otto, 2008; see also Lussier, Heil, Mongeon, Badger, & Higgins, and Prendergast, Podus, Finney, Greenwell, & Roll, 2006). No other application of behavioral analytical principles has been more thoroughly tested in randomized clinical trials, which is the gold standard research design in medicine.

This chapter is structured in five sections. Section one reviews the historical background of operant conditioning interventions aimed to reduce drug use. Section

two describes variants of CM as follows: voucher-based CM, prize-based CM, employment-based CM, and combinations of CM with pharmacotherapy. Section three explains the essential components and procedures in CM interventions. Section four describes some of the barriers to disseminate CM, and the final section discusses how new technology is making the use of CM easier and more effective.

1. Historical Background

Evidence of the role of operant conditioning principles in the development and maintenance of substance abuse began to emerge in the 1950s with studies conducted in controlled non-human laboratory settings. Many of these studies used a procedure in which animals could self-administer drugs via intravenous catheters. These reports showed compelling evidence animals will learn new responses, such as pressing a lever, when the response produces a dose of drugs typically abused by humans (e.g., Deneau, Yangita, & Seevers, 1969; Headlee, Coppock, & Nichols, 1955; Weeks, 1962). Demonstration of the powerful reinforcing properties of psychoactive drugs have also been observed in a study in which monkeys were exposed to unrestricted choices between intravenous injection of cocaine and food (Aigner & Balster, 1978). When exposed to this type of choice contingency, monkeys showed almost exclusive preference for the drug over the food, to the point that the experiment had to be interrupted due to concerns about the animals' health (see Higgins et al., 2004 for a review).

In clinical settings, the effectiveness of operant conditioning principles to modify drug use frequency was demonstrated in early studies of contingency contracting. In these studies, smokers submitted monetary deposits that were returned contingent upon not smoking (Elliot & Tighe, 1968; Paxton, 1980, 1981, 1983). Although these studies indicate that substance use behavior could be changed by modifying the contingencies of reinforcement, most of them suffered from methodological limitations, such as over reliance on self-report of abstinence, rather than objective biochemical verification of abstinence.

Stitzer and collegues (1982) conducted a more rigorously controlled study of smoking cessation using an objective measure of cigarette smoking—expired carbon monoxide (CO). This study implemented a within subject reversal design (A-B-A) to evaluate the effect of contingent monetary incentive for reduced CO levels. Monetary incentives produced reduced CO readings compared to the initial baseline, and these lower levels of expired CO remained below initial baseline levels even after the contingency of reinforcement was withdrawn.

Early clinical trials also demonstrated that substance use was sensitive to reinforcement and punishment contingencies (Hunt & Azrin, 1973; Miller, 1975). Miller (1975), for example, used a procedure that featured multiple incentives to reduce drinking among "skid row" alcoholics. In this clinical trial, twenty chronic recidivist alcoholic men were randomized to a contingent reinforcement condition or a non-contingent reinforcement control condition. Alcohol abstinence was monitored via staff observation of intoxication and negative breath alcohol tests. Patients assigned to the contingent condition could access a variety of services from local agencies (e.g., employment, shelter, clothing, food, etc.) contingent upon sustained sobriety, whereas those assigned to the control group had access to the same services independent of their alcohol use. Patients assigned to the contingent reinforcement group substantially and significantly decreased their alcohol consumption and number of public drunkenness arrests relative to the non-contingent reinforcement group. The contingent reinforcement group also spent a significantly greater amount of time employed. Studies such as this are powerful demonstrations of the therapeutic potential of operant conditioning procedures in the treatment of drug use.

Another behavioral approach that has been used effectively with alcoholics is the community reinforcement approach (CRA). In this approach, the therapist, client, and family member (e.g., spouse) work together to re-arrange naturalistic reinforcers, such as vocational, family, and social reinforcers, in order to increase overall reinforcement for sobriety. This approach was introduced by Hunt and Azrin (1973) in a study with 16 adults admitted for treatment of their alcohol use at a local hospital. Eight patients received CRA treatment in addition to the standard treatment, and eight served as matched controls. The results of the study showed that patients who received CRA

drank substantially less, spent more time with family, worked more hours, and spent less time institutionalized, compared to matched control groups who were not exposed to the treatment. In addition, analysis of the earnings obtained over six months showed that patients in the CRA group had a mean income approximately two times larger than patients in the other group. These results were replicated in a follow-up study (Azrin, 1976), further illustrating the role of contingencies of reinforcement in the control of problem drinking.

The broad potential of contingency management to promote therapeutic change is underscored by other early studies in methadone clinics. Methadone is an opioid that is used as a maintenance therapy for adults who are dependent on heroin (see Joseph, Stanclinff, & Langrod, 1999, for a review). Methadone patients are typically required to make daily trips to a clinic to ingest their medicine under staff observation. Several studies show that the opportunity to take-home a dose of methadone can be used as a powerful reinforcer to increase abstinence from secondary drug(s) and attendance at counseling meetings among opioid dependents (e.g., Stitzer & Bigelow, 1978; Stitzer, Bigelow, Lawrence, Cohen, D'Lugoff, & Hawthorne, 1977). Taken together, the early studies conducted in the 60s and 70s in laboratory and clinical settings demonstrate that drug use is a malleable behavior that can be changed via the manipulation of external variables. By the 1990s, this work led to an explosion of clinical research in the domain of CM. In the next section we review four variants of CM that have been the focus of the majority of this clinical research: voucher, prize, employment-based CM, and combinations of CM with pharmacotherapy.

2. Variants of CM

2.1. Voucher-Based CM

In early 90s, the US experienced a cocaine epidemic. The complete lack of effective pharmacotherapy for cocaine use left psychosocial approaches as the only option. It was within this context that the use of operant conditioning principles in substance abuse clinical research surged (Higgins et al., 2004). The surge was led by Stephen Higgins and colleagues from the University of Vermont, who extended the

application of operant conditioning principles to the treatment of cocaine abuse (1991, 1993, 1994). The intervention Higgins developed, termed voucher-based contingency management treatment, was starkly different from psychosocial approaches built on the assumption that addiction was a product of mental pathology. In this approach, patients earn monetary vouchers, which are exchangeable for goods and services (e.g., electronics, clothing, etc.), contingent upon abstinence. The interventions evaluated in these studies contain many features that became standard in successful application of this type of treatment, such as the delivery of the reinforcer contingent upon objective verification of the target behavior, a frequency of monitoring sufficient to detect any instance of drug use, ascending amount and reinforcement bonus for consecutive days of abstinence, and resetting of reinforcement amount upon relapse. These features are described in more detail in the following section of the chapter.

The first study compared 12-step counseling and a behavioral treatment package comprised of voucher-based CM and CRA (Higgins et al., 1991). A total of 25 cocaine-dependent adults were admitted to an outpatient cocaine treatment program. The first 13 admissions were assigned to the CM + CRA package, and the following 12 were assigned to the 12-step counseling program. Results indicated that the participants assigned to the behavioral package did significantly better than the ones assigned to the 12-step program with respect to treatment retention and drug abstinence. The proportion of patients who remained in treatment throughout the entire treatment was two times higher in the group receiving the behavioral package compared to the 12-step counseling (85% vs. 42%). This study provided compelling evidence that the behavioral package was superior to 12-step counseling, but was limited by the fact that patients were consecutively admitted, rather than randomly assigned to the study conditions. To address this limitation, Higgins and colleagues conducted a randomized clinical trial comparing the same two treatments, and results in terms of retention and abstinence were nearly identical (Higgins et al., 1993).

Although these two clinical trials show evidence that the behavioral package is superior to standard counseling treatment, they do not permit inferences about the contribution of each component of the behavioral package—voucher-based CM vs. CRA. To evaluate the relative contributions of each component, Higgins and colleagues

(1994) conducted a randomized clinical trial in which cocaine dependent individuals were randomly assigned to CRA + CM treatment condition, or CRA treatment condition only. CM was in effect during weeks 1-12, but the study evaluated the effects of treatment for 24 weeks. Results showed that patients assigned to CM group were more likely to complete treatment and achieve longer durations of abstinence. More specifically, completion rates among CM participants were 90% and 75% at weeks 12 and 24, respectively. Among non-CM participants, completion rates were 65% and 45% during the same time periods. The average duration of continuous abstinence among CM participants was 7.2 and 11.7 weeks across 12 and 24 weeks, respectively. The average duration of continuous abstinence among non-CM participants was 3.9 and 6.0 weeks during the same time periods. This was the first study to isolate the effects of voucher-based CM in the treatment of drug use.

The positive clinical effects of CM demonstrated in these trials led to a great deal of research in the subsequent 15 years. Voucher-based CM has now been demonstrated effective in promoting abstinence from methamphetamines, opioid, alcohol, tobacco, and marijuana (see Higgins, Silverman, & Heil, 2008; Gupta, 2015, for reviews). A meta-analysis comparing the efficacy of psychosocial treatments concluded that contingency management had the largest effect size (Dutra et al., 2008; see also Lussier et al., 2006, and Prendergast et al., 2006). Other forms of CM have been developed and also systematically tested in randomized clinical trials. In the next section we review three additional types of CM interventions.

2.2. Prize-Based CM

A variant of CM that retains many of the features of voucher-based CM is prize-based CM (also known as the fishbowl technique). In this approach, patients earn the opportunity to draw from a bowl and earn prizes when the target behavior is objectively demonstrated. In the typical procedure, patients can draw prize slips contingent upon meeting therapeutic goals such as drug abstinence. Some prize slips consist of encouraging messages, such as “great job!”, and the other prize slips consist of “small”, “large”, or “jumbo” prizes. Small, medium, and jumbo prizes, are prizes

worth about $1, $20, and $100, respectively. In the typical configuration, there is 50% chance of drawing a non-winning slip of paper. The probabilities of drawing a small, large, and jumbo prizes are typically 41.8%, 8.0%, and 0.2%, respectively. Detailed description of prize-CM and implementation procedures are described in Petry (2012).

One of the main differences between prize- and voucher-based CM is the schedule of reinforcement. Instead of reinforcing the target behavior continuously (FR schedule), prize-based CM reinforces the behavior intermittently. In essence, prize-based CM incorporates a variable-ratio schedule of reinforcement. The great advantage of this schedule is that it reduces the costs associated with reinforcement because the target behavior is not reinforced every time it is observed. Although patients have a chance of earning a reinforcer of high value in each draw, the overall rate of reinforcement obtained during the entire treatment is low. The issue of cost in CM interventions is discussed more thoroughly in a subsequent section of this chapter. Another important difference between this approach and voucher-based CM is the fact that prizes are kept on-site and therefore can be earned and exchanged more immediately.

To this date, one study has compared the efficacy of voucher- and prize-based CM (Petry, Alessi, Marx, Austin, & Tardif, 2005). In this study, a sample of 142 cocaine or heroin dependent patients were randomized to standard treatment, standard treatment + prize-CM, or standard treatment + voucher-CM. Both CM conditions produced longer durations of abstinence and treatment retention compared to the standard treatment, but no statistically significant differences were found between the two CM conditions. Patients assigned to either CM condition earned an average of approximately $300. Thus, this study demonstrates that when the amount of financial incentive is equivalent, both procedures produce similar results. However, it is important to note that voucher-based CM treatments usually deliver larger amounts of financial incentives during treatment than the amounts used in this study. Typically, patients earn on average about $600 in vouchers (Higgins et al., 1994; Silverman, Higgins et al., 1996).

The first study evaluating the efficacy of prize CM was conducted by Petry and colleagues (2000) with a sample of alcohol-dependent men enrolled in a Veterans

Affairs (VA) outpatient treatment program. This study is noteworthy because it was the first controlled clinical trial implementing CM to promote abstinence from alcohol. In this 8-week clinical trial, 42 patients were randomly assigned to one of two treatments: Standard care, which was comprised of 12-step meetings, coping skills training, relapse prevention, and AIDS education, or standard care + prize-CM. Objective evidence of abstinence was obtained via breathalyzer samples obtained from both groups at each daily visit to the VA. Only patients in the CM group, however, had the opportunity to draw prizes contingent upon the provision of negative samples. Sixty nine percent of patients assigned to CM group remained abstinent during the entire treatment period, whereas 39% remained abstinent in the standard care during the same period. Results also showed that patients in the CM group were less likely to relapse to heavy drinking (26%) by the end of the study, defined as drinking five or more standard drinks on an occasion, relative to standard care patients (61%). Patients in the CM group were also more likely to stay in treatment compared to patients in the standard care (84% vs. 22%). On average, CM patients earned $200 worth of prizes.

In a subsequent study, Petry and colleagues (2004) evaluated the effects of prize-CM in a sample of 120 cocaine-abusing patients initiating treatment at a community outpatient center. Patients were assigned to one of three groups: standard care, standard care + prize-CM with a maximum of approximately $240, and standard care + prize-CM with a maximum of approximately $80. Overall, results of this study showed that $240 CM was efficacious in increasing durations of abstinence and in reducing drug consumption compared to STD treatment. Although $80 CM produced intermediate results, it was not statistically different when compared to standard treatment. Therefore, these results replicate the ones obtained with alcohol dependent patients receiving over $200 during CM conditions (Petry et al., 2000), and suggest that that the positive benefits of CM are magnitude-dependent.

The results observed in these randomized clinical trials lead the National Institute on Drug Abuse Clinical Trials Network (CTN) to choose prize CM for evaluation in community drug abuse treatment settings (Peirce et al., 2006; Petry, Peirce et al., 2005). More than 800 stimulant-abusing patients, recruited from 14 community-based methadone and psychosocial treatment clinics across the country, including rural areas,

participated in these randomized clinical trials. These studies replicated earlier results obtained with prize-CM. CM treatment produced longer duration of abstinence and greater retention compared to standard treatment. The effects observed in these studies have also been observed among other substance abuse populations, such as polydrug users (Petry, Weinstock, & Alessi, 2011; Petry, Weinstock, Alessi, Lewis, & Dieckhaus, 2010) and individuals dependent on nicotine and opioids (Petry, Alessi, Hanson, & Sierra, 2007; Petry & Martin, 2002; Alessi, Petry, & Urso, 2008).

Despite being an efficacious treatment for substance use disorders, CM has not been widely implemented in clinics across US or other countries. In the past few years, however, this scenario seems to be changing. For example, some programs have begun using prize CM in clinical care settings (Kellogg, Burns, Coleman, Stitzer, Wale, Kreek, 2005; Ledgerwood, Alessi, Hanson, Godley, & Petry, 2008; Lott & Jencius, 2009; Squires, Gumbley, & Storti, 2008) in the US. In 2011, the VA began providing funds to support training and initial implementation of CM in VA outpatient substance abuse treatment clinics across the US (Petry, DePhilippis, Rash, Drapkin, & McKay, 2014). This VA initiative is arguably the biggest development in terms of dissemination of CM. To this day, over 92 clinics have initiated CM treatment across the US and clinicians have been preparing “success stories”. Lately, CM has been disseminated to other countries besides the US. United Kingdom, for example, has begun applying CM more widely (Pilling, Strang, & Gerada, 2007; Ballard & Radley, 2009; Tappin, et al., 2012)

2.3. Employment-based contingency management

In this variant of contingency management, the opportunity to work and earn wages is contingent upon provision of drug-free urine samples, or on engaging in other behaviors that may facilitate recovery. By using wages from work rather than direct payments to promote drug abstinence, the cost of the intervention can potentially be reduced to the cost of the drug testing program. In this way, it is possible to maintain long-term, large magnitude abstinence reinforcement in a manner that is practical and low-cost. This is important because early studies found that treatment effects may not be maintained after contingency management intervention is discontinued, and that

reinforcement magnitude is a factor in the success of contingency management intervention (see Barriers of CM section below for additional discussion of these points).

Employment-based contingency management was developed by Dr. Kenneth Silverman, who had previously spearheaded the delivery of contingency management interventions to people living in poverty in the inner city (Silverman, Higgins et al., 1996; Silverman, Wong et al., 1996). Chronic unemployment and a lack of job skills and education are common in this population. For that reason, Silverman designed his intervention, called the Therapeutic Workplace, as a two-phase intervention.

The goal of phase one is to initiate drug abstinence and provide job and academic skills training. In phase one trainees are paid to engage in job training while required to supply drug-free urine samples under direct observation on a thrice weekly basis. Earnings depend on a combination of an hourly wage and performance pay bonuses, and delivered in the form of gift cards or similar financial products. Payments can be requested and claimed on a daily basis. Only trainees who provide drug-free urine samples as required are admitted to the workplace. In the case of a missing or positive sample, the hourly wage is temporarily reduced and then increases on a daily basis until restored to the full wage. Thus, using drugs results in reduced earnings through a combination of reduced opportunity to work and temporarily reduced wages. This phase is typically implemented for six months.

The goal of phase two is to maintain drug abstinence in the context of bona fide employment. In this phase, the rate of drug testing is systematically decreased as abstinence is maintained. The drug tests are delivered randomly and unpredictably, though at a lower rate. Earnings are delivered every two weeks in the form of traditional paychecks. As with phase 1, only employees who have submitted the required drug-free urine samples are admitted to the workplace. In the case of a missing or positive sample, the performance bonuses are temporarily reduced and the most frequent urine testing schedule is reinstated. In this way, a monetary consequence can be delivered without violating minimum wage laws. In theory, this phase could be implemented indefinitely. A detailed description of all aspects of the two-phase Therapeutic Workplace intervention is available elsewhere and is beyond the scope of the present chapter (see Silverman et al., 2005).

The Therapeutic Workplace intervention was initially evaluated in a randomized controlled trial. Participants were unemployed pregnant or postpartum women who continued to use heroin or cocaine despite being enrolled in a methadone maintenance treatment program. Forty participants were randomly assigned to usual care (n=20) or to usual care plus the Therapeutic Workplace intervention (n=20). An analysis of the phase one intervention showed that Therapeutic Workplace trainees were significantly more likely to submit urine samples that indicated abstinence from opiates and cocaine (50% vs. 27%; Silverman, Svikis, Robles, & Stitzer, 2001). In addition to evaluating the effects of the intervention on drug use, another key question for this early study was whether unemployed drug users would even attend a job skills training program. Although attendance was by no means perfect, eight of the 20 trainees attended regularly, 45% of possible training shifts were attended by the Thereapeutic Workplace group as a whole. A separate analysis evaluated the effects of phase two during a 30 month period that immediately followed the end of phase one (Silverman et al., 2002). That analysis showed that opiate abstinence (60% vs. 37%) and cocaine abstinence (54% vs. 28%) were significantly higher in the Therapeutic Workplace group when compared to the usual care control group. A closer look at the date indicated that while only one control participant maintained 100% abstinence from cocaine throughout the evaluation period, six Therapeutic Workplace participants were able to do so. In addition, only eight of the control participants ever provided consecutive cocaine negative urine samples at monthly assessments, whereas 16 of the Therapeutic Workplace participants were able to do this during the study period. Taken together, these results show that the Therapeutic Workplace effectively increases drug abstinence relative to usual care, and produces profound and sustained effects in a significant number of participants.

After this initial study, a critical question remained unanswered: Were the drug abstinence contingencies a critical component of the Therapeutic Workplace intervention? Though empirical evidence on the topic was sparse (Magura, 2003), it was a possibility that the training and employment opportunities provided in the Therapeutic Workplace were the critical aspect of the intervention. To address this, two additional randomized controlled trials were conducted in which the control participants received

access to the training and work independent of their drug use. As in the prior study, Therapeutic Workplace participants were required to submit drug-negative urine samples to maintain their access to the workplace. The first trial was an evaluation of cocaine abstinence initiation in refractory methadone patients (Silverman et al., 2007). The trial examined phase one only. Results indicated that the employment-based drug abstinence contingency significantly increased the amount of cocaine negative urine samples (29% vs. 10%). The second trial evaluated whether abstinence contingencies were necessary to maintain drug abstinence after it had been successfully initiated (DeFulio et al., 2009). Refractory methadone patients were invited to participate in the study as phase one trainees (n = 128). Participants who initiated opiate and cocaine abstinence, attended regularly, and developed necessary job skills (n = 51) were invited to serve as data entry operators for one year and randomly assigned to receive the employment-based drug abstinence contingency (n = 27) or to access the workplace independent of their drug use (n = 24). Over the course of the year of employment, participants who received the contingency submitted substantially and significantly more cocaine negative urine samples than non-contingent controls (79% vs. 51%). Taken together, these studies show clearly that the drug abstinence contingency is necessary for initiating and maintaining drug abstinence in the Therapeutic Workplace.

2.4. Combinations of contingency management and pharmacotherapy

Pharmacotherapy has been an essential tool in the treatment of substance use disorders. The most commonly used pharmacotherapies work by producing effects similar to those of the problem drug. For example, nicotine gum is useful in the treatment of cigarette smoking, and methadone is useful in the treatment of opioid use disorders. For the purpose of this chapter, we will refer to these kinds of pharmacotherapies as substitution therapies. Other pharmacotherapies work by altering the physiological and subjective effects of drugs of abuse. Examples of this kind of pharmacotherapy include disulfiram for alcohol use disorders (which causes immediate hangover-like effects upon consumption of alcohol), and naltrexone for opioid use disorders (which blocks the “high” associated with drugs like heroin). For the purposes of this chapter we will refer to these as aversive pharmacotherapies, because the

underling behavioral mechanism for their effectiveness is either punishment or extinction. Although not exhaustive, these two categories are appropriate for the vast majority of pharmacotherapies for substance use disorders. Combining pharmacotherapy with contingency management has been called “a perfect platform” for the treatment of substance use disorders, due principally to the compatibility and robust success of these treatments when used in combination (Carroll & Rounsaville, 2007).

In terms of substitution therapies, contingency management often works to improve abstinence outcomes over pharmacotherapy alone. For example, a randomized controlled trial by Preston et al. (2000) showed that methadone patients who received a contingency management intervention significantly increased opiate abstinence over time relative to methadone patients who received usual care. A second use of contingency management in combination with substitution therapies is to address polydrug use in cases where pharmacotherapies do not exist or are not readily available for one of the problem drugs. For example, it is commonly the case that someone with an opioid use disorder will also have a cocaine use disorder. Methadone reduces opioid use but does not affect cocaine use. In fact, there is no clearly effective pharmacotherapy for cocaine use disorders. Thus, there are many people who continue to use cocaine despite being enrolled in a methadone maintenance program. In cases like these, drug abstinence contingencies can be applied to promote abstinence from multiple drugs (e.g., opiates and cocaine). The Therapeutic Workplace studies described in the previous section serve as examples of this. Note that in interventions with multiple drug targets, it is traditional to introduce individual drug contingencies in a stepwise fashion (e.g., Donlin et al., 2008). Only after drug abstinence has been initiated with one drug is a new contingency layered on. Although this practice makes sense logically and conceptually, there is little evidence to support it relative to simultaneous introduction of drug abstinence contingencies for multiple drugs. In addition, there are some studies that report successful implementation of multiple drug contingencies simultaneously (e.g., Carroll et al., 2002).

Predictably, treatment retention is a serious problem in aversive pharmacotherapies. Thus, a critical target in the case of contingency management in

the context of aversive pharmacotherapy is medication adherence. Preston et al. (1999) evaluated the role of medication adherence contingencies in promoting treatment retention and ingestion of naltrexone. Their three group randomized controlled trial included a group in which participants received monetary vouchers contingent upon naltrexone adherence, a group in which participants received vouchers independent of taking naltrexone, and a no voucher group. The study continued for 12 weeks and all participants received free naltrexone. Results showed that medication adherence contingencies significantly and substantially increased treatment retention relative to no vouchers. In fact, nearly 50% of medication adherence group participants completed the study, compared to only 5% of no voucher controls. Perhaps more importantly, the contingency group took significantly more doses of naltrexone than either of the other two groups in pairwise comparisons (21.4, 11.3, and 4.4 mean doses ingested, respectively). The oral formulation of naltrexone used by Preston et al. required thrice weekly ingestion. More recently, injectable extended-release formulations have been developed that require only a single dose every four weeks. Unfortunately, retention is still fairly poor for extended release naltrexone. DeFulio et al. (2012) conducted a six-month randomized controlled trial in which participants assigned to the Therapeutic Workplace were required to accept extended-release naltrexone injections to maintain their access to paid phase one training, while non-contingent control participants could access the paid training independent of their acceptance of the injections. All injections were provided for free in a building that was easy walking distance from the Therapeutic Workplace. Nevertheless, 74% of naltrexone contingency participants completed the full course of naltrexone, compared to only 26% of non-contingent controls. In summary, it is clear that contingency management has the potential to substantially improve outcomes when used in conjunction with pharmacotherapies for the treatment of substance use disorders.

3. Essential components and parameters/procedures of CM

The effectiveness of CM intervention dependents on pivotal aspects of the particular procedures used by clinicians. In this section, we describe some of the most important elements of effective CM intervention in the treatment of drug abuse.

As with any behavioral intervention, accurate measurement of the occurrence and non-occurrence of the behavior is a necessary feature of effective implementation of CM as a drug abuse intervention. As noted earlier, this entails objective verification of drug use. Thus, CM interventions demand the incorporation of some kind of test capable of providing a reliable biological marker indicative of abstinence.

The time a drug can be detected is an important but very complex issue that varies depending on numerous factors, such as the type of drug being tested, the sensitivity of the monitoring system being used, route of administration, severity of drug consumption, variation in metabolic clearance, the cutoff of the analytic technique, and the specific metabolite that is sought (Verstraete, 2004). The majority of monitoring systems target a specific drug metabolite to confirm drug use. The detection of the metabolite benzoylecgonine and 9-carboxy-A^9 tetrahydrocannabinol in urine testing, for instance, signify the presence of cocaine and marijuana, respectively. The most commonly used monitoring system for illicit drug use is urine testing. One of the main reasons is that urine has high concentration of metabolites. In addition, urine testing provides quick results, it is relatively non-invasive, and it allows a long detection window (Vandevenne, Vandenbussche, & Verstraete, 2000). Typically, the detection period of cocaine ranges from 1.5 to 7 days, heroin ranges from 1 to 1.5 days, and marijuana ranges from 2 to 30 days (Vandevenne, et al., 2000).

There are other forms of drug monitoring, including analysis of oral fluid (i.e., saliva), breath, and blood (or serum or plasma) specimens. An advantage of these monitoring systems is that they provide evidence of recent exposure, that is, they provide information that the individual was under the effect of the drug when the sampling was taken. Oral fluid and breath testing offer additional advantage over urinalysis-based testing in that that the specimens are readily accessible for sampling, and testing is less invasive, compared to urinalysis testing. A disadvantage of these monitoring methods, however, is that the detection time is shorter than in urine (Verstraete, 2004).

The most frequently used monitoring system for licit drugs, such as alcohol ingestion and cigarettes smoking, is breath testing. Cigarette smoking is accessed via the measurement of breath CO levels, and alcohol via breath-alcohol concentrations.

Both drugs are eliminated very quickly from the body. The elimination half-life of CO is approximately four hours (Javors, Hatch, & Lamb, 2005). Alcohol measured in breath sample reaches its maximum concentration approximately 60 minutes after alcohol consumption, and decreases quickly afterwards (Jones, 2008). Typically, an individual who consumes moderate amounts of alcohol shows no breath alcohol concentration after four hours after drinking, and a smoker shows non-smoker CO levels within 12-24 hours of abstinence (Javors, et al., 2005; Jones, 2008).

Thus, it is critical to decide which monitoring system will be incorporated in a CM intervention. Once a detecting system is chosen, it is pivotal to determine the frequency on which the behavior will be monitored. This is one of the most challenging and demanding aspects of CM interventions because as noted above, detecting systems vary widely across types of drugs, and the monitoring schedule should be arranged in way that it can detect any instance of drug use. Despite such variable detection times, illicit drug use, such as cocaine and heroin, is usually monitored 3 times per week in CM interventions, and this schedule seems sufficient to detect any drug use. CM studies targeting alcohol and cigarette smoking have typically incorporated daily monitoring schedules.

Another important variable that must be considered carefully when implementing CM interventions is the magnitude of reinforcement. A meta-analysis of the literature showed that greater monetary value of vouchers is associated with larger effect sizes of CM interventions (Lussier et al., 2006). As noted earlier, Petry et al. (2004) compared the outcomes of two prize magnitudes—$240 and $80—and found that higher magnitudes were more efficacious. Within the context of voucher-based CM, Silverman and colleagues (1999) compared the outcomes of different voucher magnitudes in a sample of cocaine-dependent patients who had been resistant to a CM treatment in which they could earn up to $1155 contingent on abstinence. In this study each patient was exposed to a control condition, in which no monetary vouchers were provided, and a low and high magnitude condition in which they could earn up to $382 and $3480 in vouchers, respectively. A significant higher percentage of patients in the high magnitude condition achieved > 4 weeks of continuous abstinence relative to the

other conditions. Similar results have also been reported among cigarette smokers receiving different amounts of money (Stitzer & Bigelow, 1983).

To promote continuous abstinence, CM interventions also incorporate an ascending schedule of reinforcer delivery for consecutive negative samples submitted with a reset. This is a component that has become standard in successful CM interventions because longer durations of continuous abstinence during treatment is one of the best predictors of long-term treatment success (Higgins, Badger, & Budney, 2000; Higgins, Wong, Badger, Ogden, & Dantona, 2000; Petry et al., 2005). The ascending schedule combines positive and negative reinforcement operations to promote behavior change. For instance, Higgins et al (1993) implemented an escalating system in which the presentation of a negative sample was initially worth $2.50 voucher, and each subsequent negative sample resulted in an increase of $1.25. In addition, to further increase the likelihood of continuous abstinence, patients earned $10 bonus voucher each three consecutive negative samples. Whenever a patient submitted a positive sample, the voucher value was reset to its initial $2.50 value.

Prize-based CM also includes an ascending schedule of reinforcement to promote continuous abstinence. Patients earn additional draws based on the number of consecutive negative specimens provided, and to limit costs, a cap at a particular number is typically set. For example, Petry, Alessi, et al. (2005) implemented an escalating system in which the number of draws increased by one for each consecutive negative sample submitted. In addition, patients earned a bonus of five draws every three consecutive samples. Whenever a patient submitted a positive sample, the number of draws was reset to one. Table 1 shows an hypothetical scenario to illustrate the ascending schedule procedure with bonus within the context of both prize - and voucher- CM. In this scenario, the patient submitted four consecutive negative samples, followed by a positive sample, and then two more negative samples.

Table 1. Hypothetical scenario to illustrate the ascending schedule procedure with bonus within the context of both prize- and voucher-CM. In this example, the patient submitted 4 consecutive negative samples, followed by a positive sample, and then two more negative samples.

Day	Sample Test Result	Voucher Value in Voucher-CM	Number of Draws in Prize-CM
1	Negative	$2.50	1 draw
2	Negative	$3.75	2 draws
3	Negative	$15 ($5 + $10 bonus)	8 draws (3 draws + 5 bonus draws)
4	Negative	$6.25	4 draws
5	Positive	$0	0 draw
6	Negative	$2.50	1 draw
7	Negative	$3.75	2 draws

One voucher-CM study compared experimentally an ascending reinforcement schedule (including bonus and reset) against a fixed rate of reinforcement in a sample of cigarette smokers (Roll, Higgins, & Badger, 1996). Patients assigned to the ascending schedule were less likely to resume smoking once they became abstinent than those patients assigned the fixed schedule of reinforcement.

Despite evidence suggesting that the ascending schedule helps preventing relapse, the low initial value of the reinforcing consequence for abstinence is a potential concern. Some patients do not remain abstinent long enough to contact reinforcement. Iguchi and colleagues (1996), for instance, reported that almost half of methadone-maintained substance abusing patients in CM treatment did not obtain any reinforcer. A plausible explanation is that the initial value used in ascending schedules of reinforcement may be too small to serve as an efficient reinforcer for initial abstinence. To date, however, there is no empirical evidence supporting this hypothesis. Silverman and colleagues (1998) compared the standard escalating schedule of

reinforcement against an escalating schedule with a startup bonus and found the latter contingency did not improve outcomes.

It is also possible that some patients do not contact reinforcement because the transition from drug use to complete abstinence is too abrupt. For example, in order to submit a negative cocaine urine sample, a patient must achieve two to three days of abstinence. Shaping gradual reductions in drug use instead of complete abstinence at the beginning of treatment may increase chances that patients will contact the reinforcement contingencies. Many studies have used shaping procedures to promote initial abstinence from cocaine (Correia, Sigmon, Silverman, Bigelow, & Stitzer, 2005; Elk, Schmitz, Spiga, Rhoades, Andres, & Grabowski, 1995) and nicotine (Dallery, Glenn, & Raiff, 2007; Lamb, Kirby, Morral, Galbicka, & Iguchi, 2004; Lamb, Morral, Galbicka, Kirby, & Iguchi, 2005). However, the reinforcement of gradual reductions of drug use is only possible when quantitative testing system is available, and many onsite testing systems provide only qualitative indices of substance use.

Another variable that immensely impacts the effectiveness of CM treatment is the delay to reinforcement. There is a growing body of literature showing robust evidence that the value of reinforcers decreases hyperbolically in function of time (see Green & Myerson, 2004; Madden & Bickel, 2010 for reviews), so it is very important to reinforce the target response as soon as possible. CM studies in laboratory and clinical settings indicate that shorter delays between the receipt of the conditioned reinforcement (e.g., vouchers) and the exchange for goods and services are more efficacious than longer delays (Roll, Reilly, & Johanson, 2000; Rowa-Szal, Joe, Chatham, & Simpson, 1994). In addition to the exchange delay, the time between the target response and conditioned reinforcement delivery is also important. An association between voucher-delivery immediacy and larger effect sizes has been reported in a meta-analytical review of CM studies (Lussier et al., 2006).

Thus, CM interventions are efficacious, but its success requires the incorporation of several key components that makes its implementation challenging for most treatment centers, especially the ones in the community. This may be one of the issues preventing the dissemination of this approach. In the next section, we discuss some of the factors that may be preventing the dissemination of this approach.

4. Barriers of CM

Despite all the empirical evidence demonstrating the efficacy of CM treatments for treating substance abuse, CM has not been widely implemented in clinical practice across the US. One of the main issues preventing the dissemination of CM into treatment programs is its cost. As noted earlier, effective CM interventions incorporate high magnitude reinforcers with an escalating system plus bonus for continuous abstinence. The problem, however, is that this reinforcement system increases the overall costs of the intervention. In some effective 12-week voucher-CM treatment, for example, patients could earn up to $1200 (Higgins et al., 1991, 1993, 1994; Silverman, Higgins et al., 1996). Although patients earnings are on average half of that amount ($600) (Higgins et al., 1994; Silverman, Higgins et al., 1996), the high cost of this intervention is prohibitive in many clinics. Therefore, new strategies are necessary to diffuse this evidence-based treatment to clinical setting while maintaining its efficacy.

Prize-based CM is an efficacious treatment in which the overall cost is lower compared to voucher-based CM. Because patients do not draw prizes on about 50% of the draws, the overall cost is low. Typically, the programmed maximal reinforcement in a 12-week treatment program is on average approximately $250 to $400, but patients' earning over the course of treatment is approximately half of that amount. In the CTN studies evaluating prize-CM in community based clinics, patients earned on average $120 and $203 in reinforcers over the course of 12 weeks of treatment (Peirce et al., 2006; Petry et al., 2005). The lower cost of prize-CM is helping the dissemination of this intervention. Treatment programs are now starting to implement CM in clinical settings and the VA launched an initiative to incorporate CM in its substance abuse treatment programs. As part of this initiative, the VA provided funding for training and for CM implementation support nationwide (i.e., funding for incentives, testing procedures, etc.). Approximately 100 clinics received this funding in 2011 (Petry, et al., 2014).

In addition to cost, another barrier that hinders dissemination of this treatment is public opinion. The use of incentives into treatment programs often stirs controversy (Priebe et al., 2009; Proemberger, Brown, Ashcroft, & Marteau, 2011; Promberger, Dolan, & Marteau, 2012). Individuals against incentive interventions sometimes claim that they are paternalistic and interpret financial incentives as coercive.

One study evaluated public opinion regarding different types of interventions in United Kingdom and in the US (Promberger et al., 2011). The results showed that financial incentive programs are perceived as less acceptable than medical interventions (pills or injections) of same efficacy. In addition, the authors also found that the acceptability of financial incentive program is affected by whether or not the individual receiving treatment is responsible for their condition or not. For instance, the utilization of financial incentives in substance abusers is viewed as less favorably than in mental health patients.

The use of financial incentives is also controversial among treatment providers, who sometimes express ethical objections and concerns about its practicality (Cameron & Ritter, 2007; Kirby, Benishek, Dugosh, & Kerwin, 2006). Fortunately, studies also show that training treatment providers changes their beliefs and attitudes toward CM (Rash, DePhilippis, McKay, Drapkin, & Petry, 2013) and that negative beliefs about CM diminish once providers begin implementing CM (Kellog et al., 2005; Petry & Bohn, 2003). Therefore, dissemination should focus also on education efforts.

Another issue frequently raised is maintenance of treatment effects. Some CM studies have shown maintenance of effects after the reinforcement contingency is removed (e.g., Higgins et al., 2000; Iguchi et al., 1997); however, the positive treatment outcomes of CM are not always maintained long-term following discontinuation (e.g., Rawson et al., 2002; Rawson et al., 2006). It is important that researchers develop procedures to enhance generalization of treatment effects. In the context of physical activity, Andrade and colleagues (2014) implemented an intermittent schedule of reinforcement which gradually became leaner over 12 weeks after the target behavior was effectively modified. Performance was not sustained at 24-week follow up but remained at higher levels compared to baseline. A similar thinning schedule to promote generalization of treatment effects in a sample of cocaine dependent patients is currently being tested by Petry and colleagues but results have not been published.

Therefore, there are barriers to the dissemination of CM, but these barriers seem all surmountable and continued efforts to disseminate this intervention are likely to prove successful when effective parameters are used. Some of the barriers to

implement efficacious CM treatment can be circumvented with the use of remote technology, a topic described in the next session.

5. Technology

The incorporation of modern technology into CM programs holds great potential to facilitate the implementation of CM treatment and improve patients' outcome. As noted earlier, one of the greatest challenges associated with CM interventions, is the frequent clinic attendance for monitoring purposes. Technology helps reduce the burdens associated with clinic attendance. For example, Dallery and colleagues (2007) implemented a voucher-CM program targeting nicotine abstinence using internet technology. Patients were loaned CO monitors and laptop computers with built-in cameras, and were asked to record and send videos over the internet of themselves providing CO samples. Relative to baseline, results showed significant decreases in CO levels during the reinforcement condition. In addition, very high rates of sample collection was reported (98%). This study was innovative not only because the target behavior was verified remotely, but also because conditioned reinforcement in the form of vouchers was delivered immediately over email. As noted earlier, shortening the delay between the target behavior and reinforcement increases the efficacy of the intervention.

The incorporation of internet technology in CM interventions also allows reaching populations that have difficult access to clinics. A similar internet CM protocol to the one described above has been evaluated in a sample of smokers from rural US areas (Stoops et al., 2009). Smokers assigned to internet CM condition were more likely to submit negative samples compared to controls.

Another device that holds promise for disseminating CM intervention is smartphone. These devices also have video capabilities and they are more portable than laptop computers, a feature that reduces even further the challenges that monitoring the target behavior imposes on patients and treatment providers. Videos can be recorded and submitted electronically virtually from anywhere, and the target

behavior can be reinforced almost immediately. A recent study (Alessi & Petry, 2013) evaluated the feasibility and initial efficacy of a CM procedure that included phone. Patients were given hand-held breathalyzers and a cell phone, and were randomized to one of two conditions. In one group, patients were given compensation for submitting dated time-stamped breathalyzer videos. In the other group, patients were compensated for submitting breathalyzer videos and also received compensation for samples indicating non-drinking. During four weeks, participants were prompted one to three times per day to submit breath samples. Overall, 89% of the requested breath samples were submitted on time. Patients who were reinforced for negative samples were abstinent on 87% of the days whereas patients being compensated for sending the videos only were abstinent on 67% of the days.

In addition to smartphones, another device that has been used to promote alcohol abstinence in the context of CM intervention is the Secure Remote Alcohol Monitoring Bracelet (SCRAM, Alcohol Monitoring Systems, Highlands Rach, CO). This bracelet is a transdermal alcohol sensor that takes readings about every 30 minutes and transmits the results to a central monitoring system remotely. Barnett and colleagues (2011) evaluated the feasibility of this device in a study in which heavy drinkers wore SCRAM continuously for three weeks. In the first week, participants were asked to drink as usual (baseline), and in weeks 2 and 3, they were exposed to a voucher CM intervention targeting abstinence. The average reduction of transdermal alcohol concentration readings from baseline to intervention weeks was 72%. More recently, emerging technologies such as BACtrack Skyn™ have been produced that allow for robust continuous monitoring of alcohol use while appearing fairly indistinguishable from other health monitoring wearable devices such as the Fitbit™.

Technology is a very rapidly developing area and so the specific technology mentioned in this section is likely to improve quickly. However, irrespective of the specifics of the technology, it will certainly help improve dissemination and access to CM treatments.

Conclusion

Numerous randomized clinical trials in the past 35 years have evaluated and demonstrated that CM is a very efficacious treatment for substance use. In this chapter we reviewed some of the groundbreaking studies that used operant conditioning principles in the laboratory and in clinical settings that have demonstrated the utility of operant conditioning principles to modify drug use. These studies culminated with the development of a more sophisticated set of procedures that are currently being incorporated in treatment settings across the US and starting to be used in other countries. This chapter has described some of the most successful variants of CM, and the most important elements and parameters embedded in this procedure that are essential to its effective implementation. This chapter has also discussed some of the barriers preventing the wide dissemination of this approach and some potential ways that these barriers can be circumvented. Lastly, this chapter described how technology is facilitating the implementation of CM by altering dramatically how drug use behavior can be monitored and reinforced remotely. These changes are likely to improve the dissemination of this evidence-based treatment approach.

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2 Higher-order verbal behavior: theoretical–empirical analysis of autoclitic effects on non-verbal behavior

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The empirical analysis of the experiments presented in this chapter focused on the autoclitic operant, considered by Skinner (1957) to be a higher-order operant, as it is accompanied by the basic operants and depends on them for its installation. Therefore, this chapter will begin with the approach to the basic verbal operants, although briefly, and then detail the autoclitic operant and follow with the research conducted in relation to this operant. Lastly, this chapter discusses the operant's effects on non-verbal behavior.

Although the proposal for a functional analysis of verbal behavior has been available since 1957, with the publication of Skinner's book "Verbal Behavior," the basic processes of this behavior and its relationships with non-verbal behavior are still being understood, and studies of these relationships can be considered even today as a productive line of empirical research.

In "Verbal Behavior," Skinner (1957) cautions that the work consists of an interpretative exercise and not a presentation of experimental data. This alert originates in the context of Behaviorism, "the willingness to deal with the facts," with the empirical, "even when they are opposed to what you want," and is one of the characteristics that the author considered a reputable scientific attitude (Skinner, 1953). However, this exercise of interpretation of the controlling variables of verbal behavior was supported by experimental studies of the behavior of organisms, performed by him since 1938, from which the behavioral basics — including those of reinforcement — were discovered.

Verbal operants

Skinner's (1957) book proposed to describe the variables that control verbal behavior from the specification of a three-term contingency: 1) from the condition in which the verbal response occurs, 2) from the response itself, and 3) from the consequence of the response. According to Skinner, different verbal modalities — for example, vocal (speech) or motor (writing, gesture, music) — and different or equal topographies — for example, magazine (a publication) and magazine (of a gun) — assume different functions in these contextual relationships among antecedents, responses, and consequences.

Verbal relationships can be identified from the specification of these control variables, whose differences determine distinct verbal operants. The conditions in which the verbal response occurs can be events with motivational (establishing operations) or discriminative/evocative functions; consequences of responding include reinforcing stimuli, usually intermittent and generalized (for example, the "approval" or "attention" of the listener) but, in some cases, specific reinforcing stimuli (for example, the thing someone is asked). The presence of a listener is a condition *sine qua non* for the emergence of antecedent and consequent functions, and the actual listener acquires evocative function for a type of operant (always remembering that the speaker and listener can be the same person).

The verbal operants defined by Skinner (1957), in a broad view, can be divided into two major groups: first-order operants (echoic, dictation, copy [or transcription], textual, tact, mand, intraverbal), to which Skinner (1957) refers as the raw material from which verbal behavior results, and second-order operants (autoclitics). The first order can be divided into two major subsets: 1) those whose control comes from a formal relationship between the response and the antecedent condition, which Skinner called "point-to-point," and 2) those whose control arises from a thematic relationship between the response and the antecedent condition and are, therefore, without similarity/correspondence.

Autoclitic: higher-order verbal operant

Autoclitics have central functions in the verbal behavior approach (Catania, 1998). The etymology of the word, according to Epting and Critchfield (2006), is the combination of *autos* (self) and *klit-* (lean on) and describes refinement in verbal behavior. Its principal function is to modify and specify (or "refine") the effect of the primary verbal relations on the listener. In plain words, the autoclitic operant is "talking about talk"; it is the speaker leaning on his or her own verbal operants, composing, creating, inventing, directing, evaluating, organizing, selecting, and producing more accurate responses under the control of the primary responses, of these properties, or of the conditions that they control.

Thus, the autoclitic operant of Skinner (1957) refers to the arrangements that the speaker makes in his or her own speech. Skinner states that no speaker is a mere spectator of his or her speech but an active being who organizes and arranges the way of speaking, making explicit the controls on his or her own behavior. If someone says, for example, "Reading is pleasurable to me," the tact on the reading is qualified by the autoclitic "is pleasurable to me," which qualifies (adjectivizes) the tact in a positive way, giving the listener clues on the reinforcing value of the event described in the tact. It is a verbal operant that alters the function of other verbal operants that accompany it, softening, qualifying, highlighting, quantifying, and so on. Put another way, they are parts of the verbal behavior that modify the other parts that accompany them. One of the effects of autoclitics, indicated by Skinner (1957), is the increase in the precision of control on the listener's behavior. Therefore, autoclitics can be understood as verbal responses to primary verbal responses, making the primary functions more effective (Borloti, Fonseca, Charpinel, & Lira, 2009). Accordingly, there are two systems responses, one based on the other with the higher system only being understood in relation to the lower (Skinner, 1957). Thus, the autoclitic can be classified as a higher-order verbal operant (Abreu & Hübner, 2011).

Skinner (1957) divides the autoclitics into various types and highlights, among them, descriptive, qualifying, and quantifying. Descriptive autoclitics are characterized as responses that describe the relationships of control over the speaker's own behavior. The verbal community establishes contingencies for a description when asking, for

example, what the person said and why he or she said it. "I said I would be late" is an example of a descriptive autoclitic. Well-developed verbal environments encourage the speaker to issue descriptive side-responses of his or her own verbal behavior. Skinner (1957) hypothesized that the immediate effect of the speaker's descriptive autoclitic verbal emission changes the reaction of the listener. In the example mentioned above, it can reduce aversive consequences on the part of the listener.

Qualifying autoclitics exercise their qualifying function on the tact by intensifying or modifying the direction of the listener's behavior. The answer "no," as an example of an autoclitic qualifier, has the force of a mand. A person could say, "Do not miss the class" or "Do not think about this problem" where the autoclitic may have a distinctive effect on the listener. "Is" can also be characterized as a autoclitic qualifier. In the example "Reading is nice," the verb qualifies the activity of reading as being nice.

Quantifying autoclitics, in turn, affect the listener by indicating properties relative to the quantity of the basic operant emitted by the speaker. For example, in the instruction "Separate the seeds with great care," the verbal operant "great" could be classified as qualifying autoclitic of the first-order verbal operant "care" (Abreu & Hübner, 2011).

The stimulus function prioritized in Skinnerian analysis for descriptive, qualifying, and quantifying autoclitics is the function performed on the listener. In fact, the author concludes that "the ultimate explanation of autoclitic behavior lies in the effect it has on the listener—including the speaker himself" (Skinner, 1957, p. 344).

In summary, the autoclitic is an operant normally involved in the composition of the speaker's verbal behavior, but above all, it was created to investigate its distinguishing effect on the listener's behavior. For this reason, its study can be inserted into the line of research investigating links between the verbal behavior of the speaker and the listener, even in conditions in which both are one and the same.

A proposal of empirical studies on qualifying autoclitic and their effect on the listener's behavior

One of the effects of autoclitics, indicated by Skinner (1957), is the increase in the precision of control on the listener's behavior. If the speaker is also the listener, the tact with autoclitic could increase control over his or her own behavior. If the autoclitic is qualifying and the qualification is positive, could there be an increase in the probability of the reinforcing value of the qualifying event — and, consequently, an increase in the probability of emission of non-verbal behavior described and qualified by the tact with autoclitic? Would a "motivational" relationship be established between the qualified event and behavior related to it?

Questions like these guided research conducted by the first author of this chapter and led by students who held undergraduate, master's, and/or doctoral degrees at the Verbal Operants Studies Laboratory (LEOV) of the Psychology Institute of the University of São Paulo, from 2003 to the present date. The studies will be presented later in a chronological sequence, which will aid in understanding the rational and methodological evolution intended by us.

When we started the study, there was already a considerable advance in the understanding of the controlling variables of tact, including the potential of this verbal behavior in changing the non-verbal (Catania, Matthews, & Shimoff, 1982; Catania, Shimoff, &Matthews, 1985; Catania, 1998; Torgrud & Holborn, 1990; Ribeiro, 1989), and, therefore, a place was found for tact in behavior analysis: the power to instruct non-verbal behavior (De Rose, 1997).

According to De Rose (1997), as behavior analysis progressively deals with complex human behaviors, the need to work with verbal behavior increases not only because the complex human is a strongly verbal being (Catania, 1998) but also because, through verbal behavior, we can modify non-verbal behavior.

De Rose (1997) highlights, just as Skinner (1957) does, that the tact operant is the most important of the verbal operants due to its correspondence (reference) with the things or facts of the world. He considers that the results match the way the community establishes a repertoire of tacts: weakening the relationship with any

particular deprivation or aversive stimulus and establishing a special relationship with a discriminative stimulus. We achieved this by strengthening the response as consistently as possible in the presence of a stimulus with a generalized reinforcer. The resulting control is the antecedent stimulus.

Therefore, we chose this operant to be the experimental (independent) variable in our research because we knew this to be an operant that would be sensitive to shaping. We included qualifying autoclitics, supposing that, by their modulating effects of precision of control on the listener, they could transform the tact and have a role in self-learning.

One of the principal and provocative statements of Catania on the subject, which motivated us to conduct the research, was as follows:

> Another correspondence important to the verbal community is that between what we say and what we do. Here also the correspondence can operate in both directions: If we do something we can say we've done it, and if we promise to do something we can do it. To the extent that the verbal community arranges contingencies for these correspondences, we can change behavior not only by instructing the behavior but also by shaping what's said about it. If both saying and correspondences between saying and doing are reinforced, doing may follow. Through such contingencies, one's own verbal behavior may become effective as an instructional stimulus. (Catania, 1998, p. 270)

Therefore, if both authors, Skinner and Catania, are right in their analyses, the reinforcement of a speaker's tacts with qualifying autoclitics could bring out the corresponding non-verbal behavior (by the history of reinforcement in our culture, for example, pairings between names that positively qualify one activity — such as the word "funny" and the positive reinforcing stimuli associated with such a word).

In a concise and interesting method of approaching verbal behavior and of inserting this control function into non-verbal behavior, Catania (1998) summarizes the

functions of verbal behavior: to exercise instructional control, to form autoclitic processes, and to establish relationships of equivalence.

The challenges and methodological limitations were constant, but the interest of the group of students in the subject of "autoclitics" and its effects kept the flame alive and maintained a desire to get it right, seeking empirical answers that ultimately aimed to find procedures that could maximize, via the verbal "shortcut" and in a subtle way, the appearance of important responses in the human being. We knew that one of the implications of our studies would be for the practices of the clinical psychologist, as Salzinger (2003) predicted, to a large extent, clinical practice can be interpreted as an attempt to install or change relevant nonverbal behaviors from the conversations between client and therapist.

In addition to this implication, we found that, at any given time, we were studying what in other areas is called "persuasion." Similarly, it was clear to us that aspects related to clarifications of the persuasive effects of verbal behavior on the non-verbal also contained implications for teaching, especially in the interest of the school in transmitting new values to the student.

Therefore, we say to each other what to do and what to say (Catania, 1998). Such verbal stimuli can be termed instructions. It is already known that instructions are useful and can modify the listener's behavior in situations in which the natural consequences are ineffective on their own or are effective only in the long term (Catania, 1998). Classic examples of these conditions are the use of a safety belt and guidelines for studying behavior. The consequences that benefit those who use the belt or punish non-users are sporadic and would not install the behavior of safety belt wearing if it was not for the instructional power of the rules. The same applies to the behavior of studying for a test. To wait for natural contingencies of knowledge acquisition or for contingencies to do well on tests as a means of maintaining study behavior could fail as a control relationship. The guidelines and instructions for a young student maintain the behavior of study with greater reliability in immediate terms than the natural consequences that occur in the long term (Obviously, instructional antecedent control alone will not maintain itself as sufficiently at the beginning of the

installation of this behavior; we must add, in addition to the guidelines, the immediate consequences of positive reinforcing stimuli for study behavior).

Experimental studies on instructional controls or rules show that the control of verbal descriptions is more effective if (a) the discriminative control of contingency is weak (Torgrud & Holborn, 1990; Amorim, 2001), (b) the positive reinforcing stimulus is not clear, and (c) the aversive elements of contingency are not clear (Braam & Mallot, 1990). In other words, instructions or verbal controls cannot substitute the subtleties of a direct contact with the contingencies as they end up imposing themselves. However, persuasive subtleties can distance contact with the contingencies and increase obedience or evoke the emission of behavior, even if only once (and, sometimes, once is decisive and irreversible—taking medication, having surgery, killing, committing suicide, having sex, getting pregnant, and buying, among other behaviors). Verbal control can be installed quickly and can persuade the listener to emit an irreversible action.

We have said, based on the data we have found in our research, that verbal control is temporary. However, we repeat: there are situations in which just a single emission of a response to a persuasion is enough for its effect to be harmful. This in itself justifies our preoccupation with and interest in studying the conditions under which persuasion is effective and those under which it is not. Catania (1998) discusses this potential persuasive effect of verbal behavior:

> The shaping of verbal behavior is a potent technique for changing human behavior, especially given that the distinction between verbally governed and contingency-governed behavior is relevant to verbal as well as nonverbal behavior. Verbal behavior that's shaped or contingency-governed is, like nonverbal shaped behavior, sensitive to its consequences, but it's also accompanied by corresponding nonverbal behavior: If what we say is shaped, we do what we say (p. 272).

Note that the author places great power in the verbal processes that are installed by shaping, arguing that the speaker, by not realizing the origin of his or her

speech, interprets it as originating from him or herself and, therefore, follows it more easily. In the instruction, continues the author, the other is clearly identified as its author, which can diminish the persuasive effect.

Shortly thereafter, in his text, Catania (1998) strengthens the notion that the persuasive effect of instruction would be less than that of shaped speech:

> On the other hand, verbal behavior that's instructed or verbally governed is, like nonverbal instructed behavior, relatively insensitive to its consequences, but it's less reliably accompanied by corresponding nonverbal behavior: If we're told what to say, what we do doesn't necessarily follow from what we say even if we reliably say what we were told to say (p. 272).

These ideas of Catania (1998) have had impacts in experimental research and produced many studies, particularly the provocative and controversial phrase that verbal control installs an insensitivity to contingencies. However, in our understanding, Catania was simply drawing attention to the important difference between verbal control for instruction and verbal control for shaping, understanding the latter as subtler and, at the same time, more persuasive. Much research has been conducted to verify the accuracy of this phrase by Catania (1998), originally from the study of Catania, Matthews and Shimoff (1982): "If what we say is shaped, we do what we say." One of the most cited is Torgrud and Holborn (1990), wherein the authors were able to demonstrate that, under experimental conditions where contingencies were clearly discriminated by the participants, verbal control, either by shaping or instruction, did not easily establish itself. The verbal control was only installed, as noted earlier, when the discriminative control of the contingency was weak—that is, when the diverse operation controls were not clear.

In the LEOV studies dedicated to empirically testing the scope of the phrase "If we say what is shaped, we do what we say," the autoclitic operant was added, considered by Catania to be one of the three functions of verbal behavior.

The theme is compelling if we think of persuasion in therapeutic and educational verbal processes, as already mentioned. One of the practical implications of Catania's idea (1998) is that it could be viable to change human behavior, shaping what someone says and not just what someone does. There is even an interesting provocation by the author to the cognitivists. Therapies that make reference to the modification of cognitive behavior, or to cognitive efficiency (inducing or persuading to do it)—modify client behavior by changing cognition—but this is done, in general, by changing the client's verbal behavior, says Catania.

It is necessary to discuss an ethics of persuasion by placing limits on verbal behavior. Skinner (1957) points out that words cannot move mountains. However, the compelling questions of verbal behavior show us that it can lead people to topple mountains for us (Hübner, 1997b).

Another aspect that is appropriate to understand with regard to the ethical and coercive aspects that may be involved in persuasive verbal behavior is the value of reinforcing stimuli and the benefit to the listener or the persuaded. Who benefits from the execution of the act requested or suggested in the persuasion? Experimental studies in verbal behavior may be leading us to find better ways of making the other do what we ask. Even in the face of the findings, however, we can never lose sight of this ethical question and the implications of a coercive act, even a verbal one. Further, we should only accept the most efficient ways in terms of persuasion or instructional control when the beneficiary is the listener and when the concept of benefit is widely discussed and accepted by the same listener (Here is an important ethical aspect of our research: We should always choose behaviors that benefit participants unequivocally).

Mands or tacts with positive qualifying autoclitic can be understood as persuasive in the sense that they would lead the other to do something, even if only once, by actions of low probability of emission in the history of the individual. Skinner (1957) points out that the autoclitics can perform the specific mand function on the listener when they demand a more specific action. To say "Attention!" can be an example of an autoclitic that intensifies the function of the mand of other verbal operants that accompany it.

Tacts may be accompanied by autoclitics performing the function of mands in order to increase the effectiveness of the behavior of the speaker on the listener (Skinner, 1957). An example where this occurs can be when someone says "Careful! The glass is very full, and you could spill water on me." The expression "Careful!" performs the autoclitic function and increases the chances that the listener strives to avoid spilling water on the speaker. On the other hand, if the phrase is "The glass is too full, and you could spill water on me," although it may have a mand function, and it is possible that it controls the listener's behavior as a general control tact, it is not as effective in making the listener avoid spilling water on the speaker.

Tacts with qualifying autoclitics and non-verbal effects: initial research

At the instigation of these compelling issues of verbal behavior, our laboratory started research with the following question: If we strengthen self-descriptive tacts with positive autoclitics on non-verbal specific behavior, can we expect an increase in the frequency of such behavior?

The first study that we conducted (Dias, 2000; Hübner, Austin, & Miguel, 2008) proposed to verify if reading time could be increased by differential consequences of tacts on reading with positive qualifying autoclitic on the reading in an operant-free situation in a context similar to where it is applied (a living room). Ideally speaking, the dream was to see a rise in the "awareness" of the importance of reading (which, according to Skinner, is given by self-description of verbal behavior—"only through them the speaker becomes aware of what he is doing or saying and why" [Skinner, 1957, p. 139]). We wanted to raise this consciousness after differential reinforcement of tacts with pro-reading autoclitics and, with this, to increase the behavior of reading itself. We would like to persuade children to read. For us, the benefits to the child of this persuasion, if successful, are very clear. It is logical that we are speaking about reading of quality and of texts appropriate to the ages of the children studied. In other words, to persuade, in this context, is to announce positive reinforcing stimuli of a particular response to verify if that announcement configures itself as a condition that evokes related responses.

It is known, as already presented, that external instructions can quickly install behaviors, sometimes faster than if the behavior was shaped gradually (Ayllon & Azrin, 1964). Thus, there is no reason to suppose that self-instructions are functionally different from the external instructions (Ono, 1994); both can similarly exercise control over behavior.

Self-instructions (auto-mands), or what is said about the behavior itself, can also be shaped. Quickly, we learn to describe our own performances (tacts) and to behave according to our performance. After repeated exposure to such contingencies, a two-way relationship between the verbal and nonverbal behavior can be established so that changes produced in one can produce changes in another. In this line, the shaping of verbal behavior can be employed as a strategy to change non-verbal related behavior.

The basic idea of our early experiments was as follows: Children were observed individually performing an activity of their choice (such as playing, painting, drawing, pasting, or reading) for 20 minutes while verifying what they chose to do and measuring how much time they dedicated to the chosen activity. Afterwards, in sessions resembling conversation — dialogue — an experimenter individually talked to the child about the theme of the activity chosen by the experimenter; reading, for example; about the advantages of reading, and about the contents of the books read with differential consequences of "pro-reading" statements. Differential consequences to verbal behavior occurred through expressions of approval, praise, attention, and affirmative head-nodding, paraphrases and planned questions by facilitating conditions for "pro-reading" statements (statements praising a book that point to positive aspects of reading or mentioned any favorable point in the reading activity). The experimenter asked questions such as, "Tell me the good things that you discovered reading this book ..." or "What do you think is cool about reading?"

On the following day, or two days later, the child was seen again in the situation of choice, and the chosen activity and the time dedicated to it were verified.

The objective was to see if such sessions, called "verbal behavior shaping sessions" (referring to the reading), would have any effect on the choice of reading

activity (The term "shaping" was employed in the role of Catania's terminology, who applied a similar procedure and gave it this name, but the term "shaping" would not, in all experiments, be the most appropriate term; instead, we used the term “consequencing” or “differential reinforcement.” The three terms, however, are used interchangeably in the present text). It was verified, in other words, if shaping the relevant verbal behavior (referring to the non-verbal behavior of reading) caused an increase in the time dedicated to reading in the situation of choice.

The effects of verbal behavior shaping on the response of children to the choice of reading (Dias, 2000), Verbal and non-verbal behavior: the effects of the reinforcement of tacts with autoclitics referring to reading and the time spent reading (Hübner, 2003)*, and Effects of praising qualifying autoclitics on the frequency of reading (Hübner, Austin, & Miguel, 2008)

Objective:

Check if sessions, called "verbal behavior shaping sessions" (referring to reading), would have any effect on the choice of reading activity.

Participants:

Five children (two girls and three boys) participated in the experiment. They were aged 9–10 years and attended fourth grade at a private elementary school in São Paulo with no reading habit but with oral reading comprehension.

Location and materials

The experimental sessions of shaping and observation of the response to the activities of choice were performed in a room containing two chairs, a table, and a small wooden bookcase.

In the locations chosen for the activities, the following materials were placed on a bookcase: books, magazines, glue, scissors, paper, pencils, eraser, crayons, colored pencils, modeling clay, gouache paints, brushes, and games. There was variation from session to session in the types of games and books so that there would always be one "old" game and book and two new games.

Data collection and the dependent variable

Data were collected by means of recordings and by trained observers. Observers recorded the total reading time. Reading behavior was defined as the responses of participants directed to the book and/or magazine and/or turning the pages of the available reading materials. The trust between the observers was verified in 100% of the sessions.

Experimental design

The experimental design was single-subject with repeated measures of the same participant in sessions pre- and post-experimental treatment.

Procedure

The procedure included the following stages: a) reading assessment sessions to verify if the children had any reading deficit; b) choice of sessions (lasting 20 minutes), in which children were instructed to choose between activities with toys, painting, books, and magazines, and no result was planned for the choices made by the children; and c) experimental sessions of differential consequences of tacts with positive qualifying autoclitics on reading (lasting 20 minutes), in which the pro-reading verbal reports were deferentially consequenced with attention and praise.

Children were exposed to four free operant sessions (one pre-experiment and three post-experiment) for two weeks (average duration of each session: 12 to 22 minutes). At the beginning of each pre-trial session, the general instructions were read (stating that they would have to choose whichever activities they wanted for a duration of 20 minutes, and the instructor listed the available activities).

Experimental sessions—differential consequences of pro-reading statements

Participants were each exposed to four experimental sessions (with an average time in each session of 13 to 15 minutes) during which the experimenter provided prompts so that a dialogue on reading was initiated. The experimenter began the

conversation by saying, "*Today, we will talk about reading. Tell me about a book you liked.*"

Whatever the child said that was in favor of the reading or favorable to reading was followed by expressions of approval like "Ah! How interesting! It's good that you liked it!" If the child verbalized something against reading or something unfavorable to reading, the experimenter remained briefly silent, for around five seconds, looked in another direction away from the child, and then returned to present questions about reading.

Results

Figure 1 presents the data of P1. In the pre-experimental session, P1 spent 2.5 minutes reading, and the remaining time was spent drawing and playing. In the first post-experimental session, P2 was engaged all the time in activities other than reading, and in the third post-experimental session, P1 read for the entire session. P1 did not read in the last experimental session. However, the child asked the experimenter if he or she could take a book home.

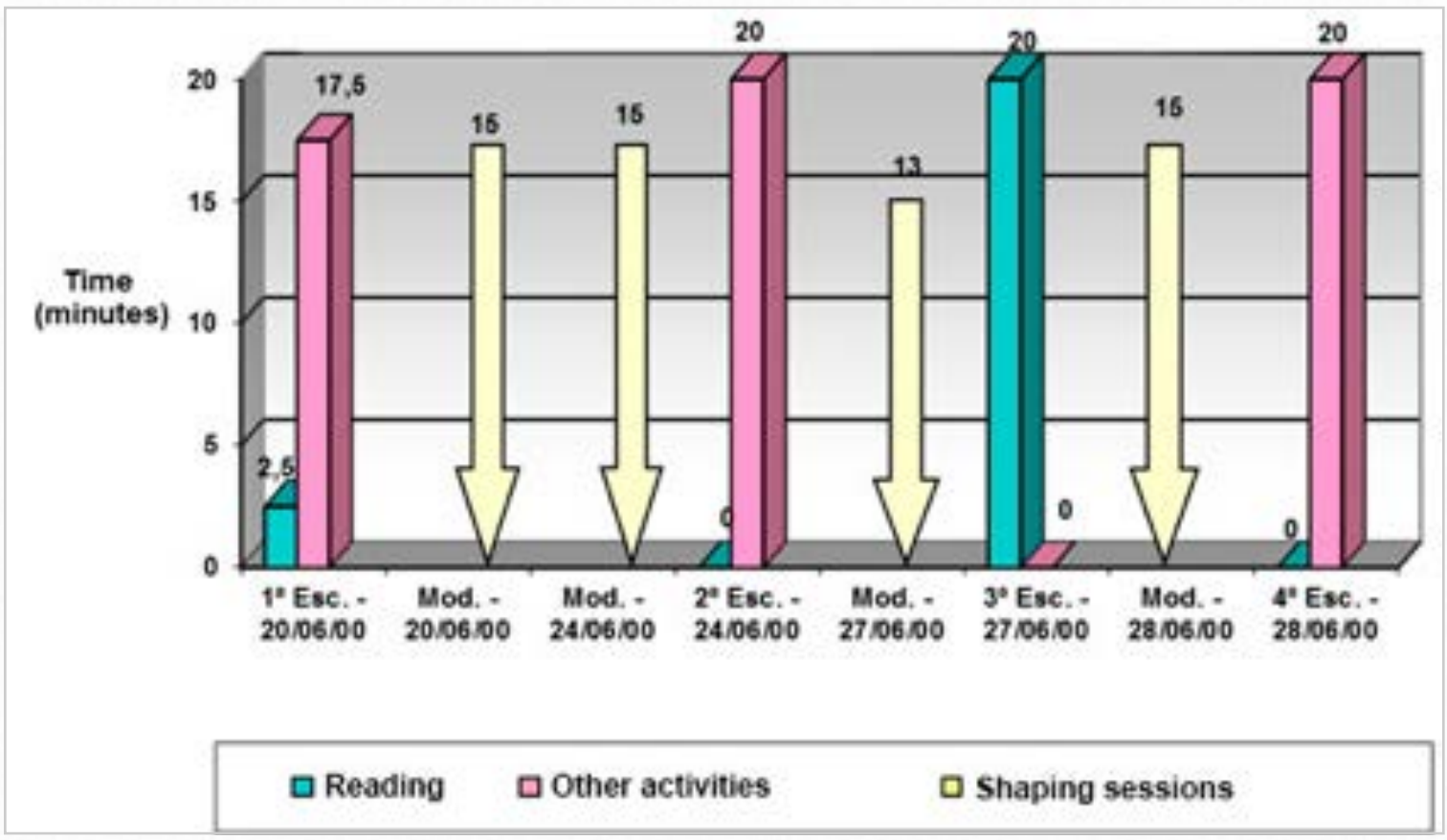

Figure 1. Total reading time in the sessions of choice for Participant P1 (extracted from Dias, 2000).

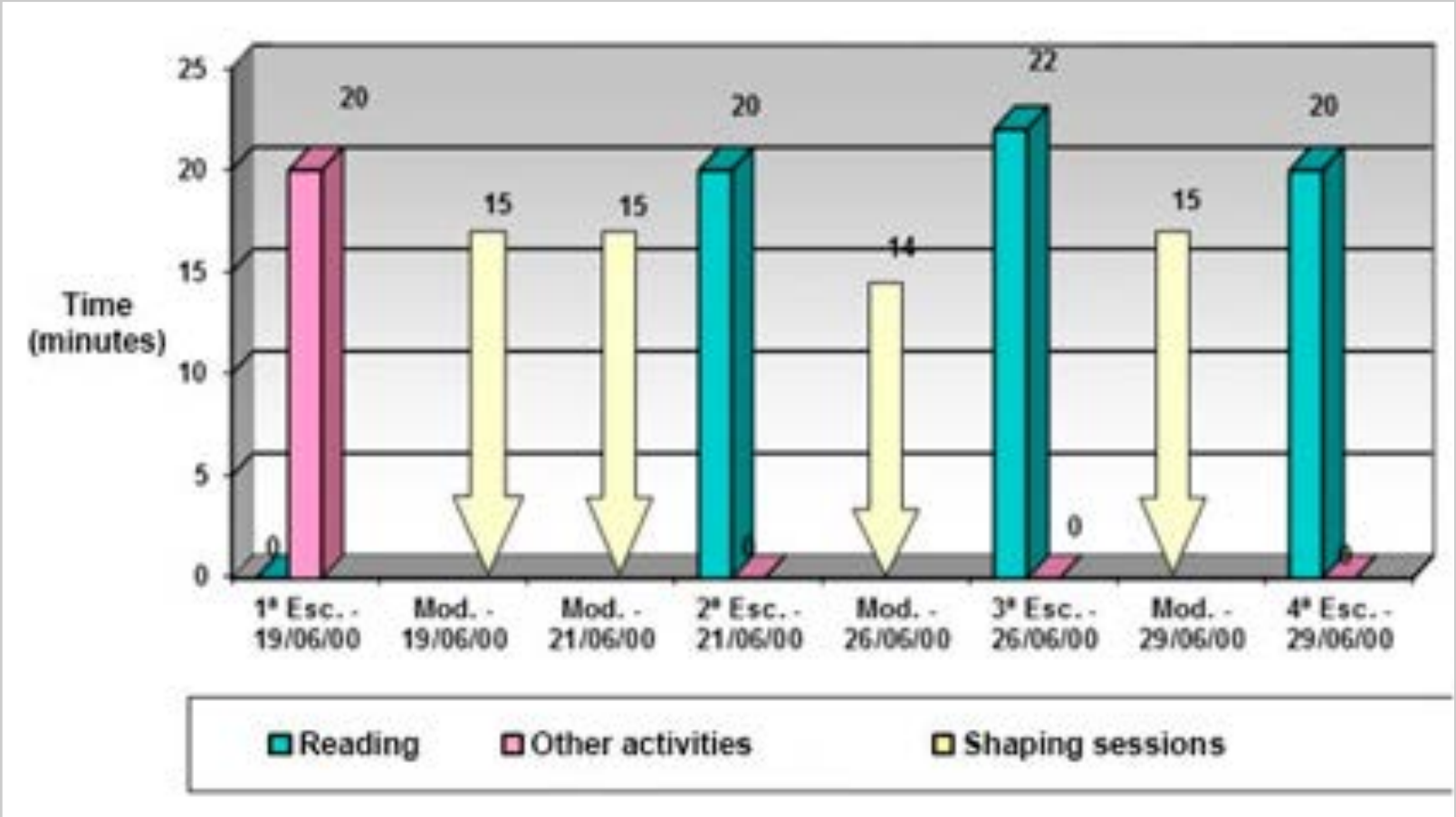

Figure 2. Total reading time in the sessions of choice for Participant P2 (extracted from Dias, 2000).

Figure 2 shows that P2 performed other activities in the first pre-experimental session—playing with toys and making drawings. In the following sessions, P2 read in all the post-experimental sessions.

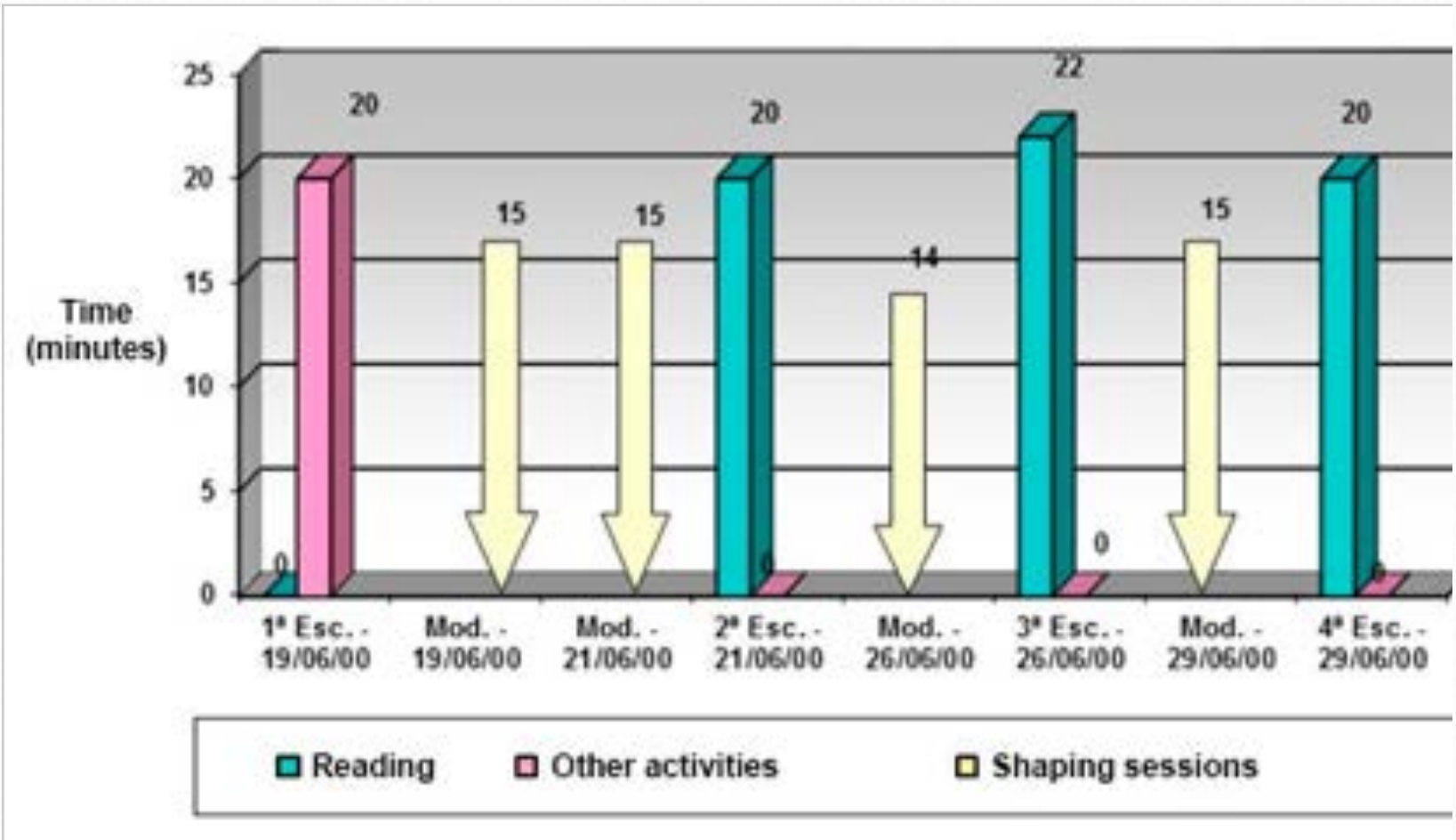

Figure 3. Total reading time in the sessions of choice for Participant P3 (extracted from Dias, 2000).

The performance of P3 can be seen in Figure 3. In the first pre-experimental session, P3 read for 15 minutes and, subsequently, after the third and fourth experimental sessions, read for 22 minutes and 20 minutes, respectively.

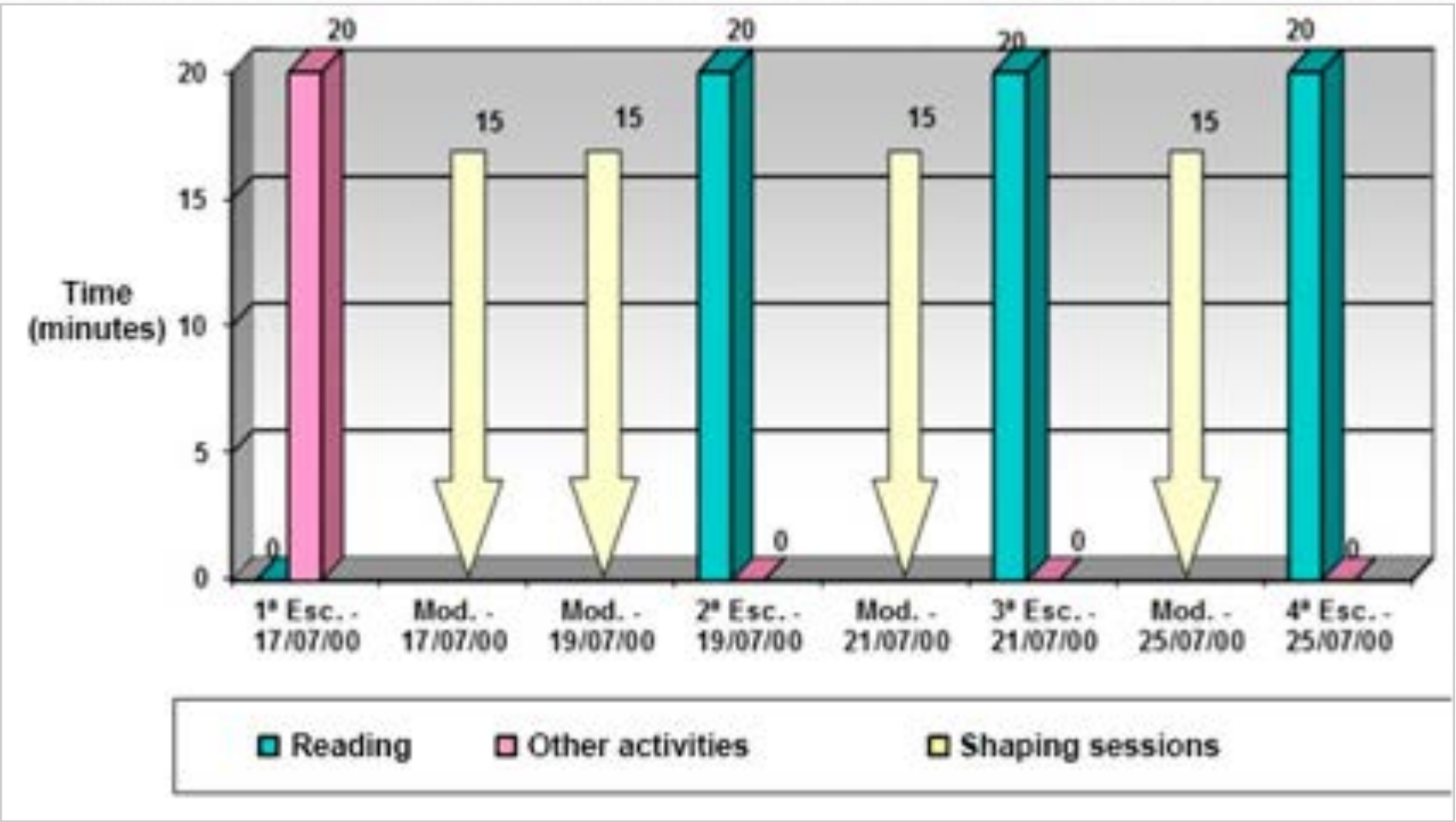

Figure 4. Total reading time in the sessions of choice for Participant P4 (extracted from Dias, 2000).

Figure 4 shows that P4 engaged in activities other than reading only in the first pre-experimental session. However, in the remaining post-experimental sessions, P4 engaged only in reading.

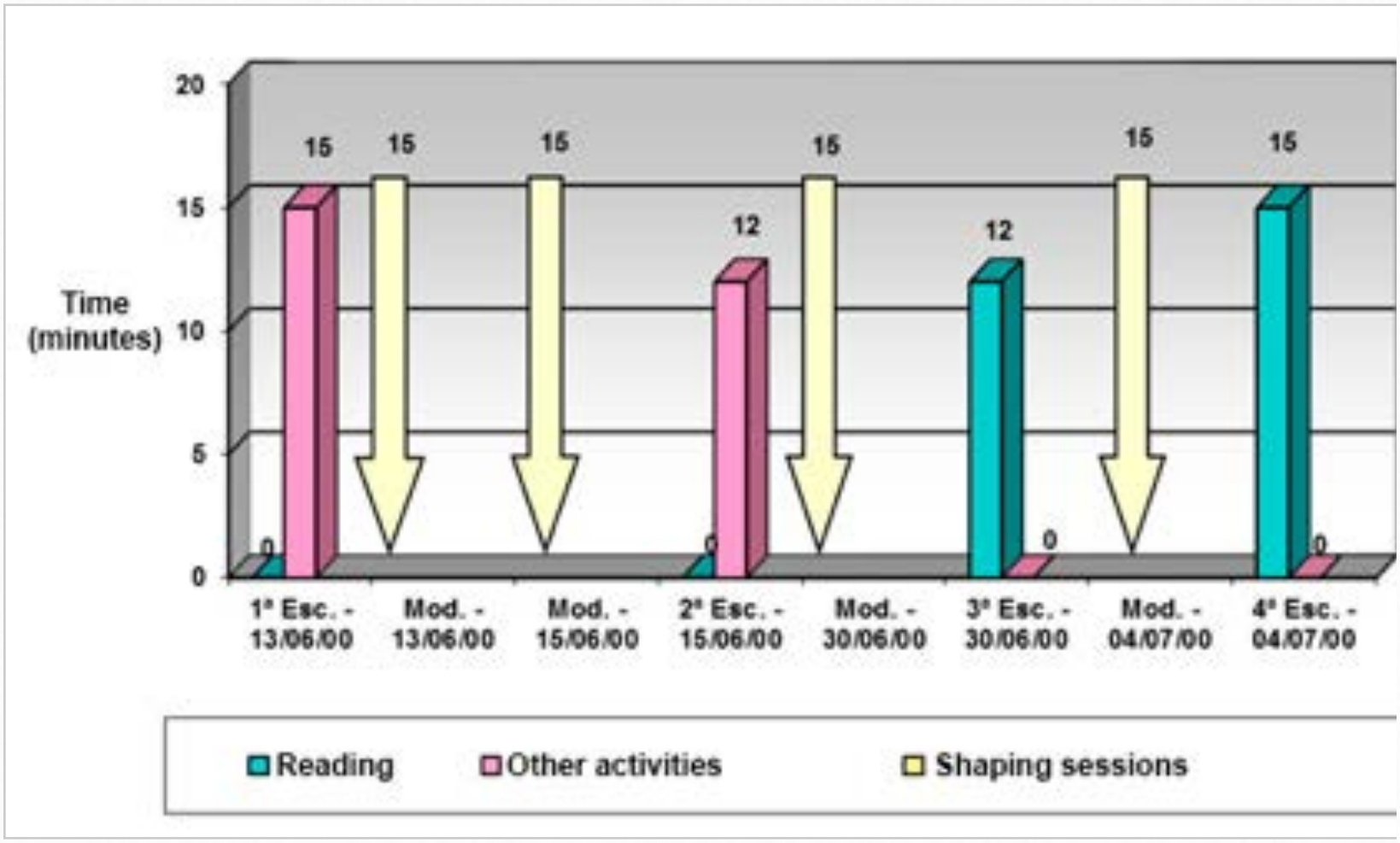

Figure 5. Total reading time in the sessions of choice for Participant P5 (extracted from Dias, 2000).

Figure 5 shows that P5 selected activities other than reading in the first pre-experimental session and in the first post-experimental session. However, in the second and third post-experimental sessions, P5 engaged in reading.

Discussion

The data suggest that the time devoted to reading by children may be increased when they are verbally praised about the activity. These results suggest that it is possible to change the duration of reading behavior by shaping what is said about it. Unlike previous studies (e.g., Catania, Matthews, & Shimoff, 1982), this effect was demonstrated in a context closer to the applied context.

A question for the following studies was the identification of the minor verbal unit, which affected the behavior of the children. For example, if a child says, "I read a book, and it was cool," this statement involves both the tact ("I read a book") and the

autoclitic ("and it was cool"). We do not know if the pure tact would have the same effect as the tact with autoclitic.

Conceptually, the study results can be explained by the process of presentation of contingent praise (as reinforcement), which increased the probability of pro-reading statements. These new statements, in turn, may have served as a function-altering event (Schlinger & Blakely, 1987) increasing the probability of reading behavior in the presence of books as well as increasing the reinforcing stimuli value of reading-related activities.

According to Skinner (1957), autoclitics increase the accuracy of the speaker's verbal control over the listener. If the speaker and listener are the same person, the autoclitics of the speaker can increase the precision of verbal control over non-verbal related behavior. In this study, saying "I read, and it's cool" (tact with autoclitic qualifier) may have affected reading behavior due to the increase in the control precision of the verbal stimulus over the related non-verbal behavior.

The results of the experiment also corroborate the literature on correspondence between verbal and non-verbal behavior (Lloyd, 2002; Ribeiro, 1989), according to which children tend to show a higher degree of correspondence between verbal and non-verbal behavior than adults.

Two important limitations of this first of a series of studies need to be addressed. The first concerns the design, which was basically an AB design with only a few measures of the effects of the experimental procedure and only a single baseline measure. The second limitation relates to the history of the children with adults and teachers; it is possible that the presence of the experimenter was a controlling antecedent variable of the emitted reading behavior. The presence of the adult can be correlated as much to the availability of the reinforcing stimuli, functioning as a discriminative stimulus, as to the correlation with punishment.

However, independent of these methodological and conceptual questions, this first study left us optimistic, suggesting that an inexpensive and easily implemented procedure can be helpful in increasing the duration of reading behavior in children (or their approach to books).

Effect of differential reinforcement of the verbal response to reading on the duration of the reading behavior (Faleiros & Hübner, 2007)

In an attempt to introduce greater experimental control than that presented in the first described study, Faleiros and Hübner (2007) sought to assess whether the differential reinforcement of verbal descriptions that qualify the activity of reading (again interpreted as tacts with positive qualifying autoclitics) may have affect the emission and duration of the reading behavior itself and the choice of photographs regarding the activity of reading.

Participants

The study included six children attending the second grade of elementary school in the public school system, all aged eight years old and belonging to the same class.

Material

A computer was used, equipped with a mouse and software specially constructed for the research. In the free choice (pre-experimental) sessions, colored pencils, paper, children's books, modeling clay, and a memory game were used.

Procedure

The procedure was divided into five stages: Baseline I, Baseline II, Training, Test I, and Test II.

Baseline I: Choice of Activities.

In the first stage of the procedure, participants chose their activities of interest. The objective of this phase was to determine what kind of activities each child choose, if there was a preference among the activities available, and how long this preference remained in each.

Each of the three sessions had a duration of 20 minutes. The sessions were performed with a 24-hour interval, totaling four days, one per day. The objects available to choose were children's books, colored pencils, paper, modeling clay, and a memory game.

Baseline II: Choice of Photographs without Reinforcement.

This stage was composed of three sessions in which each child chose one of four different photographs that appeared on the computer screen. The photographs illustrated activities such as reading, drawing, playing, and modeling. There was a set of photographs for female participants (with a girl doing an activity) and a set for male participants (with a boy doing an activity).

The objective of this phase was to determine whether the child showed any preference in the choice of photographs. Furthermore, the choices of the photographs in this phase were compared with those chosen after training to verify if there was any change in the frequency of choices made by the participants.

Three Baseline II sessions were held in sequence, totaling 36 attempts over three sessions.

Training: Differential Reinforcement of Phrase Choices Referring to Reading

On the computer screen, in each attempt, four different phrases appeared, composed of an infinitive verb, the verb "to be" in the present tense, and an adjective (e.g., To read is fun, To play is fun, To model is fun; in another attempt: To read is important, To play is important, To model is important; in another display: To read is nice, To play is nice, To model is nice). There was a randomization in the presentation of each set of sentences, equaling the number of presentations of each type of sentence, as well as their position.

The training consisted of three sessions, totaling 36 attempts. Only the chosen phrases containing the verb "to read" with a positive qualifying autoclitic resulted in points. For each correct attempt, 10 points were added to the counter, and a sound was produced to alert the participant that points were being added. The counter was located at the top center of the screen.

The points were counted at the end of the session, and the participant could exchange them for gifts that varied according to the points earned.

The aim of the training was to verify if the differential reinforcement (points), dispensed by the chosen sentences containing the verb “read” with an qualifying autoclitic, would be effective in selecting these responses and not others until the criterion of 100% accuracy in the chosen phrases containing the verb “read” was reached.

The criteria for passing to the next stage was 100% accuracy, that is, reaching the maximum score of 360 points. Therefore, the training was repeated until the standard was achieved.

Test I: Effects of Differential Reinforcement Training of Sentence Choice on the Choice of Activities

This stage was performed after the Training of Sentence Choice. This phase was identical to Baseline I and had the function of verifying the possible effect of differential reinforcement training of sentence choice on the choice of activities. Three sessions were held, one every day.

Test II: Effects of the Differential Reinforcement Training of Sentence Choice on the Choice of Photographs

Test II was identical to that performed in Baseline II and had the function of verifying whether the Training of Differential Reinforcement on Sentence Choice exerted some effect on the choosing of photographs, which reference the four activities (reading, drawing, playing, and modeling).

Results

By comparing the data obtained in the Baseline I sessions (the first column of each activity in Figure 6) with the data obtained in the Test I sessions (the second column of each activity in Figure 6), changes can be observed for most participants. All

participants showed an increase in reading as an activity choice and in the time spent on this activity.

Even participants who did not remain in the activity of reading for the entire session time showed an increase in the time spent doing so compared to the data from Baseline I.

Participant LV chose the activity of reading in the three sessions of Baseline I.

During Test I, Participant LV chose the activity of reading in all three sessions of choice, remaining in this activity for the total time of the session (20 minutes). Therefore, there was an increase in the time spent in the activity of reading.

Participant IC, in the sessions of Baseline I, presented varied choices from one session to another. However, the activity of reading was present in the three sessions of Baseline I, represented by the first column of each activity, with time spent ranging from ten to eight minutes. In the sessions of Test I, represented by the second column of each activity, the activity of reading was chosen in all three test sessions, and the time spent in this activity increased to 20 minutes in the three sessions.

Participant LA chose the activity of reading only in the second session of Baseline I, remaining in the activity for nine minutes. In other sessions, LA chose the activity of painting. However, in the sessions of Test I, the activity of reading was chosen in the three sessions, and the time spent was 20 minutes in the first session and 15 minutes in the other sessions.

Participant JS chose the activity of reading in the first two sessions of Baseline I with the time spent ranging from 15 minutes in the first session to five minutes in the second session. In the third session, JS did not choose the activity of reading. In the first session of Test I, the time spent in the reading activity was 15 minutes, but in the second, this time decreased to two minutes. In the third session, the reading time was six minutes. The time spent in the activity was high in the first session but did not remain so in the remaining sessions of Test I.

Participant FA chose the activity of reading only in the first session of Baseline I, remaining in this activity for only five minutes. In the other sessions of Baseline I, FA did

not choose the activity of reading. However, in all three sessions of Test I, FA chose the activity of reading; yet the time spent in the activity ranged from 12 minutes in the first session to two minutes in the second and eight minutes in the third. The activity of playing was the favorite in the sessions of Test I.

Participant LF did not choose the activity of reading in any of the three sessions of Baseline I, having painting as a favorite activity. However, in the three sessions of Test I, LF chose the reading activity, although the time spent varied from 11 minutes in the first session to 12 minutes in the second and eight minutes in the third. Again, the time spent in the reading activity varied from the first session of Test I and was not maintained throughout the sessions.

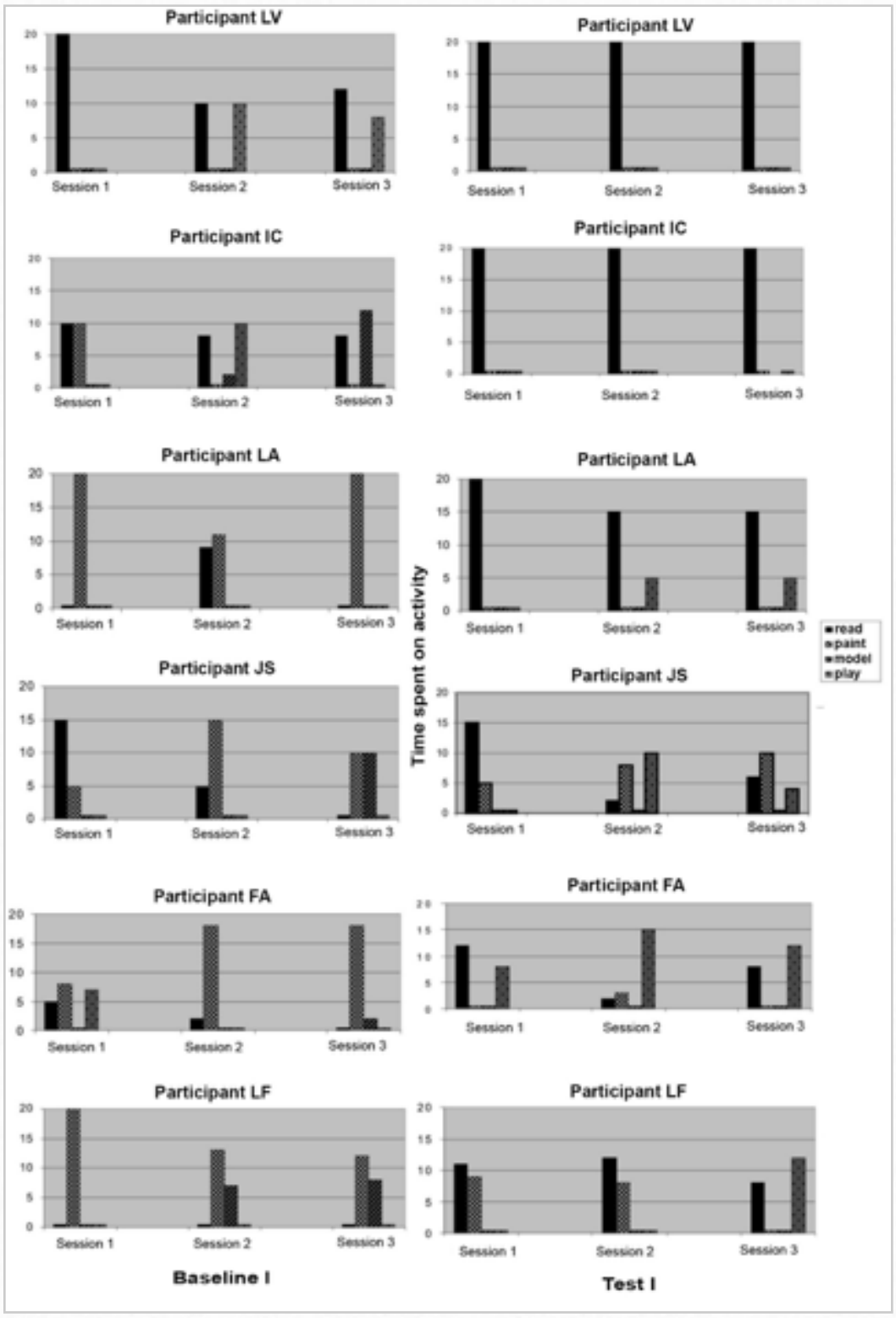

Figure 6. The time spent on each chosen activity and the type of activity chosen during the sessions of Baseline I and the activities chosen during the sessions of Test I, represented, respectively, by the right and left columns for all Participants (extracted from Faleiros & Hübner, 2007).

Figure 7 presents data from Baseline II and from the sessions of Test II (task identical to the Baseline II of choosing photographs that illustrate the four types of activities) along with the data obtained in Baseline II. The percentage of choice by

photograph for the reading activity increased compared to Baseline II for four (IC, LA, JS, and LF) of the six participants.

Therefore, in the overall result of choosing photographs obtained in Test II, one can see an increase in the percentage of the choices related to the photographs of the activity of reading. The overall percentage obtained in Baseline II was 22%, proceeding to 52% in the overall percentage of choices in Test II. Along with this increase, there was a reduction of the choices related to the other activities.

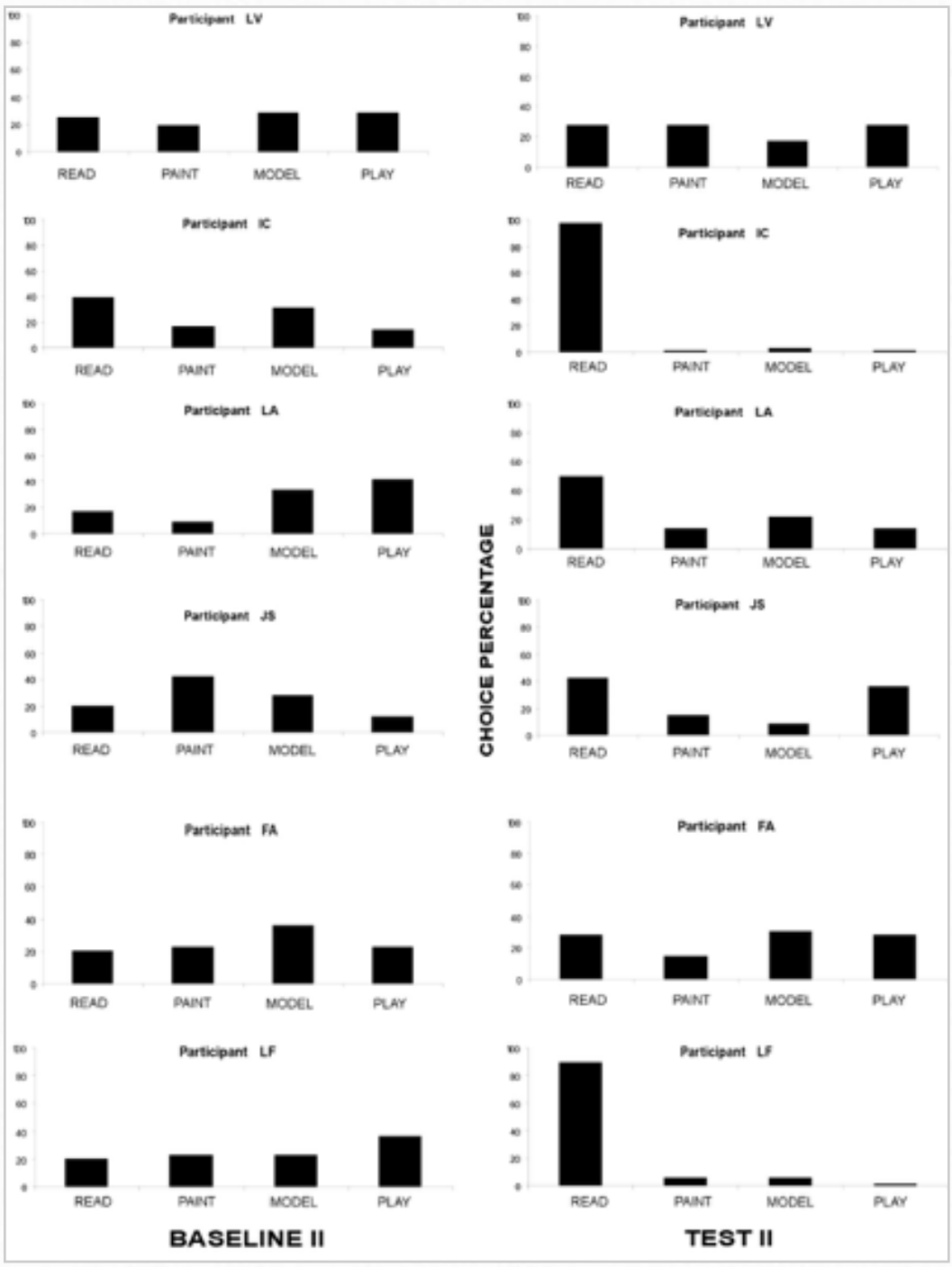

Figure 7. Percentage of choices of photographs, without reinforcement, displayed on the computer screen during the session of Phase VI, which consisted of a test of choosing photographs, without reinforcement, by the participants and the general

percentage of choice, compared to Baseline II and Test II (extracted from Faleiros & Hübner, 2007).

Discussion

The objective proposed for the second study of the series was to verify if differential consequencing of verbal responses with autoclitics would influence the emission of reading behavior and the choice of photographs related to reading and, as with the previous study, to replicate previous data and expand the generality of the studied phenomenon.

The clear identification of behavioral processes responsible for the increase in the frequency of choosing the reading activity and the time spent in this activity as well as in the choices of photographs that portrayed reading remains a challenge to be faced.

Obtaining an increase in the frequency of choosing the reading activity may be due to the verbal description, "Reading is nice (important, fun)," which may have become a function-altering stimulus (Schingler, 1993).

The differential reinforcement of the response category of mentioning qualifying sentences of the reading activity, which can be interpreted as tacts with positive autoclitic qualifiers, in the Training Sessions may have been important since, as Skinner (1957) stated, any procedure clarifying or improving the quality of a stimulus has an important discriminative function and enables the production of a response.

In the experiment of Faleiros and Hübner (2007), the allocation of points for each correct choice may have increased the verbal discriminative stimulus. Another process that could clarify and improve the quality of verbal stimuli was the sentences' autoclitic qualifiers, "is nice," "is important," and "is fun."

As already noted, autoclitics are verbal operants whose main consequence is the modification of the listener's behavior in relation to the emitted verbal response (Skinner, 1957; Hübner, 1997a; Bandini & De Rose, 2006).

As the verbal description, a product of the textual behavior of "Reading is nice," has been characterized as a function-altering stimulus, verbally controlling the response of choosing the reading activity, it has necessarily had a history of reinforcement in which, in the face of verbal descriptions of this type, consistent answers were reinforced.

Schingler (1993) states that the function-altering stimuli do not evoke the discriminative stimuli; they only alter the function of other events inclusive of the discriminative stimuli. They are antecedent events that alter other events — the discriminative stimuli that evoke determined responses. This means, in another way, that the verbal stimulus "Reading is nice" changed the function of the discriminative stimulus "book."

Moreover, the presence of the experimenter in the sessions of Activity Choice immediately after the Training Sessions may have influenced the choice of the reading activity since the experimenter was the same person who took the children to the computer and applied the sessions of differential reinforcement. This factor has already been noted by Torgrud and Holborn (1990) in their studies and is an ever-present factor in our studies. However, this aspect does not diminish the clarity of the verbal procedure controlling effect on the appearance of choosing the reading activity, since they had a much lower frequency in the baseline, in which the experimenter was also present. However, it constitutes a variable to be considered in the explanations of the behavioral process involved.

The relationship between words and events is, according to Catania (1998), established by the verbal community in both directions: we name things we see and locate the things we name. Likewise, under certain conditions, in addition to naming and locating, we do what we say and say what we do.

For a story already established by a verbal community, children discriminate the sentence "Reading is nice," but they also discriminate the relationship involved between the book and the activity of reading. Thus, they select photographs containing a child reading a book even without being reinforced in this choice. Furthermore, in the presence of the book, they emit the behavior of reading itself.

In the sentence "reading is nice," the photographs and the book may have become, over the life of the child, members of the same class of stimuli and responses and may also have constituted part of the class (Sidman, 2000). However, this does not invalidate the previous explanation on the discriminative control that the present procedure may have installed as the baseline reveals that the reading response occurred less frequently.

The formation of equivalent stimuli classes, in the context of this study, may contribute to an understanding of why these types of stimuli (texts, photographs, objects, and actions) might become related in such a short time. The life story of class formation, together with that of behavior under verbal control, can explain the speed of the effect.

Relationships between verbal and non-verbal behavior: illustrations from empirical situations (Hübner, Almeida, & Faleiros, 2006 and Hübner, Amato, Coelho, & Shima, 2009)

We continue with more research to increase generality and to isolate more variables. In parallel, we apply the same procedures with adults and with the behavior of performing physical exercises (Hübner, Almeida, & Faleiros, 2006; Hübner, Amato, Coelho, & Shima, 2009).

Participants

Two participants were part of the study. They were two college students, one a female aged 20 years old and the other a male aged 21 years old. The criteria for participant selection was a lack of regularity in performing physical exercise.

Location

Data collection occurred in two environments: in a room similar to a living room, with two armchairs, in which the experimenter and the participant sat side by side, and

in an adjacent room, where a one-way mirror was especially assembled for experimental sessions.

Equipment and Materials

Participants were observed in both environments through a VHS camcorder. In the mirrored room, there was a sofa, an exercise bike, exercise mats, dumbbells, a TV, a VCR, a video made by a physical education teacher, and magazines.

Procedure and Design

The procedure comprised the following steps:

Phase I: Baseline.

This stage aimed to observe the participants' selection of activities related to performing physical exercise in relation to other activities. It consisted of the presentation of seven situations to choose from: 1) reading magazines on various subjects unrelated to physical activity, 2) watching a video on physical exercise, 3) performing physical activity, 4) watching entertainment videos, 5) reading instructional handouts on origami, 6) practicing origami, and 7) combining any of these activities.

Each session lasted approximately 10 minutes, allowing for extra time if the participants were still performing some activity. The sessions were individual and occurred as often as was necessary in a manner that verified baseline stability. For stability, in this case, it was decided that the participant was presented, in three consecutive sessions, with the choice of activities, excluding physical activity, or that, in these three sessions, the participant performed physical exercise for just 20 seconds.

In each session, the time during which participants remained engaged in each activity was recorded.

Phase II: Differential Consequencing of Tacts with Autoclitics on Physical Activity.

During the following week, two times from five to ten minutes each, photographs were presented to the participants illustrating physical activity (photos of people swimming, running, or making use of instruments that were also present in the

mirrored room, like dumbbells and an exercise bike). Nine photos related to physical exercise were presented.

To provide a balance, participants were also presented with nine photographs of various other activities that could be performed in the mirrored room, such as making origami, reading magazines, or watching videos, in a form to allow differential consequences of tacts with autoclitics in relation to the photos of physical activity.

When the pictures were presented, one at a time, each participant was asked to describe the figure to the experimenter and to say what he/she thought of the practiced activity illustrated in the image.

The sessions of differential consequence (two) were then performed, and there were no sessions of choosing activities between them.

This was a modification related more to the study of Hübner, Austin, and Miguel (2008). In that study, the statement reinforcement sessions were interspersed with observation sessions of non-verbal behavior. The possibility has been suggested that the reinforcement sessions, which followed the observation, could be "strengthening" the non-verbal behavior of the session that preceded them by the fact that they were enjoyable and came soon after those in which the participant had emitted the non-verbal behavior (in this case, the reading, in the study of Hübner, Austin, &Miguel, 2008).

Phase III: Post-test I.

In the following week, the participants returned to the mirrored room twice a week for the same choice situation as previously presented, and the same baseline observations were performed.

If the behavior of physical exercise did not occur after the two observation sessions, two more sessions of differential reinforcement were performed, and then two more observation sessions — that is, the Session I and Post Test sequence—were repeated.

Phase IV - Complete Instruction.

If, in the Post Test I stage, the non-verbal behavior regarding the realization of some physical activity did not occur, the participants had two more sessions of ten minutes each in which the same baseline activity was prompted. However, this time, the participants received, before entering the room, an explicit instruction:

"*Enter the room, and do physical exercise, even just a little*."

Phase V: Instruction with Announcement of Non-verbal Contingency.

In the following week, participants went again to the mirrored room and were subjected, for ten minutes, to the same situation of choice presented in the baseline and in Post-test I. Before entering the room, they received the following instruction:

"*Enter the room, and do physical exercise, even just a little.*

If you do, you will earn 30 reais."

Results and Discussion

Neither participant (P1 and P2) emitted the behavior of performing physical exercise either in the baseline or in Phase III — Post-test I.

In analysis, it can be considered that there was 100% consequencing with praise or paraphrases of positive statements about the performance of physical exercises in the sessions of differential reinforcement, which may have influenced the non-emergence of physical activity in the Post-Test 1 Phase. For P1, the reinforcement occurred 60% of the time in the first session and 70% of the time in the third session. For P2, the reinforcement of positive statements about physical exercise occurred, on average, 55% of the time.

Already in Phase IV: Complete Instruction (to perform physical exercise), for both participants, there was an increased frequency of physical exercise.

In Phase V: Instruction with Announcement of Verbal Contingency, P1 remained 100% of the time performing physical activities, and P2 remained 2.5 minutes, twice as long compared to the previous phase (Phase IV: Complete Instruction).

The results indicated that the verbal behavior of differential reinforcement was not sufficient for the emergence of related non-verbal behavior. It was only after Phase IV: Complete Instruction and in Phase V: Instruction with Announcement of Non-verbal Contingency that this behavior occurred.

The discriminative control and non-verbal contingencies existent in relation to physical activity (e.g., the high cost of the response to exercise in a small room with low ventilation and under observation) may have prevailed over the verbal control that was expected to be achieved with the differential reinforcement of positive qualifying autoclitics. However, the instruction proved to be a sufficient condition for non-verbal behavior to emerge, being more powerful when it announced consequences with powerful generalized reinforcing stimuli (money).

One possible interpretation of the results may be related to the cost of responding and the aversive aspects involved: When the cost of the response is high and there are aversive consequences involved (physical fatigue, for example), only the shaping of verbal behavior proved insufficient for physical exercise to occur. Instructions were more effective (Braam & Malott, 1990), especially when powerful generalized reinforcing stimuli were announced (money).

In previous experiments, the same experimenter was involved in all the experimental stages, which could contribute to him/her being set up as an authority and an emitter of mands during the experiment.

In the experiments of Hübner, Almeida, and Faleiros (2006) and Hübner, Amato, Coelho, and Shima (2009), different experimenters were part of each step, unlike the previous experiments. In those, the same experimenter who reinforced the positive responses about reading was present in the Post-Test sessions, which could set the experimenter as a discriminative stimulus for "reinforcement," even if it was only of verbal behavior; the experimenter could work as a common link (or context) of an eventual pairing between the verbal and non-verbal responses. In this experiment, there was no common link or context.

Study II (Hübner, Almeida, & Faleiros, 2006; Hübner, Amato, Coelho, & Shima, 2009)

The initial objective of this study was to verify if the experimental conditions were unfavorable to the performance of physical exercise. Therefore, the chosen participants declared that they enjoyed physical activities and performed them regularly.

Participants

The participants were two university students, one male—P3, aged 19 years old—and one female—P4, aged 18 years old. Participants were not familiar with the concepts of behavior analysis, and they regularly practiced physical activity.

Procedure

The procedure was the same as in the previous study (the one conducted with the response of performing physical exercise).

Results

The two participants selected for this study presented, at baseline, the behavior of performing physical exercise (such as trampolining and stretching). Thus, a lower frequency behavior — making origami — was selected as the target behavior for the second study.

P3 already presented the activity of making origami in the baseline for 1.7 minutes and, after two sessions of differential reinforcement, spent the entire session time making origami. Two more sessions of differential reinforcement followed and, after these, origami-making behavior did not occur. It only returned in the first session of Phase IV: Complete Instruction and did not occur in the repetitions of the same session. In Phase V: Instruction with Announcement of Non-verbal Contingency, the behavior recurred.

P4 did not perform origami activities in Phase I: Baseline or after differential reinforcement sessions (Phase III–Post-test I). The origami-making behavior was observed after the first Phase IV: Complete Instruction, recurring only after Phase V: Instruction with Announcement of Non-verbal Contingency (money).

Discussion

When dealing with the response to origami, the shaping procedure of verbal behavior appears to have similar effects (for at least one of the participants) to those found in the studies of Hübner, Amato, Coelho, and Shima (2009), in which the response was to reading.

Regarding the shaping of verbal behavior, comparing both studies, having new conditions in the shaping procedure may not display the "success" predicted by Catania (1998), affirming that it is a powerful modification technique of non-verbal behavior. The persuasion embedded in this technique only seems to work when the response involved contains intrinsic or more natural reinforcing stimuli such as reading, when it does not involve aversive aspects, and when the speaker has less of a history of verbal behavior, which decreases the likelihood of inconsistencies between verbal and non-verbal behavior.

With adults, the verbal power only occurred more strongly via instruction that clearly explained what was to be done and, above all, when the conditions of the instruction announced powerful reinforcing stimuli.

In this sense, the persuasive power of verbal behavior seems to be directly linked to the release of reinforcing stimuli. If these are powerful in the history of the individual, and if the verbal behavior announces them, in requesting the response, this occurs in the direction that the speaker proposes or requests, directly or indirectly. The autoclitics may have had some maximizing effect of the encountered verbal power, but not sufficiently, for if they had the adults would have engaged in the activities that they valued.

Continuing our studies, we chose to further investigate the possible superiority of instruction over the shaping of verbal responses, and we returned, therefore, to children, verifying if the response shown to be costly in adults (to perform physical exercise) would also present "resistance" to the manipulation procedures of verbal antecedent conditions.

Augusto Amato, in his master's dissertation, verified whether the choice of games on the Wii (video games console from Nintendo, described below) would be affected by differential consequencing of verbal responses or by instruction. To this end, two experiments were performed.

The first experiment proposed to evaluate the effect of differential consequencing of the choice of qualifying phrases about a certain mode of game and on the choice of the mode in the game sessions. In the second experiment, the effect of instructions on the choice of modalities in the same game were verified.

The effects were categorized into three types: (A) null effect: when the distribution of responses were similar in the baseline and in the test; (B) precise effect: when a change in the distribution of responses in the baseline and in the test was identified, varying in frequency and intensity; and (C) transitory effect: when a change in the distribution of responses was identified, either in the baseline or in the test, and, subsequently, a reversal in the observed tendency was identified (Hübner, 2010).

One possible implication of these two studies (Amato, 2010 and Cillo, 2011) is, above all, in the area of sport. Small improvements in performance and/or adhesion can be obtained by verbal control, which could be the difference between a first or second place in a sports competition, where milliseconds can define victory, as in swimming. It also helps to further support the broad application of the self-talk strategy in sports (Martin & Tkachuk, 2000).

Effect of instructions on responses of checking (Abreu & Hübner, 2011)

Still in the context of obtaining practical implications from our studies, Paulo Abreu (Abreu & Hübner, 2011) conducted a study aimed at understanding verbal instructions with autoclitics, this time of another kind — quantifiers — on the responses of checking in the separation of seeds by adults. In this study, a phase was also planned without autoclitics and another with autoclitics, which constituted a methodological advance over previous studies.

It was based on experimental cognitive studies that have shown that descriptor instructions of negative consequences, that attribute excessive responsibility in the execution of a task, are an effective way to get someone to present checking behaviors (Ladouceur et al., 1995, Ladouceur, Rhéaume, & Aublet, 1997). Responsibility is defined within the cognitive hypothesis as a belief that someone possesses a power to cause or prevent crucial negative consequences (Salkoviskis, Richards, & Forrester, 1995).

The experiment of Abreu and Hübner (2011) was an adaption of the group study of Ladouceur et al. (1997) for single-subject methodology, ABCA design, therefore, with reversal in the final experimental phase. A phase with a mand associated with an autoclitic, to test the control of the listener, and a final questionnaire on the frequency of the emission of the behavior of checking during the phases was also added.

Method

Participants and experimental environment

The participants were two adult women aged 33 and 28 years old. They were invited by third parties (known to the experimenter) to work on the separation of seeds in a shop of cereals with two floors. They were instructed that the job would require an hour and that they would earn R$30,00 at the end of the task. The participants performed the separation of seeds on a table in the center of the shop on the first floor. For the separation of the seeds, four semi-transparent plastic pots with a capacity of 2L were used. Four seed types of similar color and size were mixed in a plastic bag suitable for transport: Haricot Beans, Black-Eyed Beans, Soy Beans, and Lupines. The seeds were found mixed in equal proportion. With the exception of the first instruction in person, the instructions were passed by telephone by the experimenter, who remained upstairs throughout the sessions. The separation of the seeds was recorded by the shop's camera.

At the end of the session, the experimenter revealed the experiment, explaining to the participants the objectives and origins of the research, and requested that they sign an informed consent form.

Procedure

The experimental session lasted 60 minutes divided into four 15 minute phases. The presentation time of the instructions was not counted due to the variation in the length of sentences. The timer was started at the end of the instruction presentation and was paused at the end time of each phase. A single-subject design ABCA was used, and it was organized as follows.

Phase A/Baseline: The following instruction was presented personally to the participant: "Here are four types of seeds mixed together. Your task will be to separate the four and put them in the four pots. You will have an hour to do this. I will be in a meeting upstairs, so if I need to talk to you, I will use the telephone."

During the separation, the responses of checking were counted, defined as verification of the seeds already separated into pots with the function of avoiding errors.

The following response topographies were registered in the checking: handling inside the pot itself, emptying onto the hand or table for a new check, transferring the seeds mistakenly separated from one pot to another, tilting/stirring the pot for a better view for two seconds or more, and observing the pot for two seconds or more without direct handling.

Phase B: The following telephone statement was given to the participant after 15 minutes had elapsed since instruction A: "Separate very carefully."

The autoclitic "very" was added to the separate instruction with the objective of testing the verbal control over the participant. In Phase B, the number of checking responses was also recorded.

Although, conceptually, Phase B is named “instruction with autoclitic,” it should be emphasized that an operant can only be so classified when the autoclitic effect on the participant is determined (Such conceptual observation was also an improvement compared to previous studies in which we did not mention such care, although it was always present in our discussions).

Phase C: After 15 minutes had elapsed since instruction B, the following instruction was presented, by telephone, with a description of aversive consequences:

"In fact, this batch has a type of seed that contains a large amount of a pesticide that can cause diarrhea in people who eat it. As this mixture will be used to feed children at a school, it is very important that you separate them very carefully."

In this phase, the description of all the contingencies in the separation instruction was added with the objective of testing the verbal control on the participant. The number of checking responses was then recorded.

Phase A/Reversal: After 15 minutes had elapsed since instruction C, the following instruction was presented, by telephone, without a description of aversive consequences: "My boss and I saw that the batch that you are separating is an older one that has no contaminated seeds. So just separate the seeds."

At this stage, the instruction was given with the objective of removing autoclitic quantifiers and promoting the reversal to a frequency of checking responses similar to the baseline. According to Catania (1998),

> reversible effects are changes in performance that are eliminated, immediately or at some time later, when the operations that produced them are discontinued (e.g., if the responder returns to the initial level after the punishment, the effects of punishment are reversible). (p. 408)

Thus, the effect of instruction C with the description of an aversive consequence with long-term effects (e.g., "If you do not separate correctly, children could ingest contaminated seeds") could have been reversed with a new instruction, in the case of instruction A, a descriptor of the suspension of future consequence. While the first instruction A is topographically different from the last instruction A, the criterion that allows their correlation in the adopted ABCA design is the effect that these will have on the participant. Therefore, it fulfills the functionally oriented criterion for the reversal. The number of responses of checking was also recorded in this phase.

Results

Participant 1 presented four checking responses in the baseline, none in the phase of instruction with autoclitic, three after the statement with description of aversive consequences, and zero in the reversal phase. During the final interview, she reported that, after receiving the first instruction, she was attempting to discover a method to separate the seeds that could bring her better results.

Participant 2 presented no checking responses at baseline, three in the discovery stage with autoclitic, four following the instruction with description of aversive consequences, and one in the reversal phase. Participant 2 also separated in a corner of the table the black seeds that were not part of the mixture and the seeds she judged to be spoiled.

Both participants presented obvious inter-subject variability in relation to the frequency of checking responses. As for behavioral regularities, it was observed that participants increased the frequency of checking behaviors in Phase C, and Participant 1 did it with respect to Phase B (instruction with autoclitic) and Participant 2 in relation to the baseline. Equally, in the reversal phase, both decreased the frequency after presentation of the instruction without description of aversive consequences. Participant 1 presented a complete reversal and Participant 2 a partial reversal, as defined by Catania (1998).

Discussion

As pointed out in some of the previous studies, specifying all contingencies in the instruction seems to control the non-verbal responses of participants, an effect also demonstrated in studies that manipulated rules with announcement of reinforcing consequences (Braam & Malott, 1990; Mistr & Glenn 1992; Reitman & Gross, 1996).

Similar to data obtained in the study of Ladouceur et al. (1997), it was also observed in the study of Abreu and Hübner (2011) that the instruction with description of aversive consequences controlled the checking behavior of both participants.

For Malott (1988), the next consequences would be those truly responsible, at least initially, for instructional control. According to the author, certain contingencies would act directly as negative reinforcement or punishment. The instruction given by the experimenter in Phase C described the consequence for a non-effective separation of the seeds. The specification of all the contingency functioned as an operation that established the aversive value for ineffective behavior, resulting from a non-compliance with the rule. This aversive condition, probably learned, is the result of a history of punishment in situations in which there was failure in the acquiescence of certain general classes of rules (Malott, 1988). To avoid the aversive event, the participants needed simply to follow the instruction, and it was thus reinforced by the suspension of the likely negative consequence and automatic decrease in feelings of fear or guilt (Malott, 1988). The following of the instructions can be evidenced by the increased frequency of checking responses. Given responses would have the function of avoiding errors in the separation of the seeds.

Analyzing the results in isolation, it can be observed that Participant 1 presented four checking responses during the baseline phase. This result apparently contradicts the results of some studies on rules-governed behavior, where instructions that described only the expected response of the listener exerted weak control on follow-up (Braam & Malott, 1990; Mistr & Glenn, 1992; Reitman & Gross, 1996). However, Participant 1 reported in the interview that her behavior varied until she discovered a more effective method to separate the seeds. It is possible, then, that the checks verified in this phase were taking place under the control of their own contingency rather than under the control of instruction A.

In the study, other data of interest were verified using autoclitics. In Phase B, the verbal operant "very" could be classified as being an autoclitic quantifier of first-order verbal operant, in the case of the "carefully" operant. According to Skinner (1957), the autoclitic quantifier affects the listener by indicating properties relative to the quantity of the basic operant emitted by the speaker. In the experiment, the autoclitic effect modified the reaction of Participant 2 in the task of separating the seeds. This participant showed an increase in the frequency of checking responses. It is interesting to note, however, that contrary to the expected effect, Participant 1 showed no

checking responses on the presentation of the instruction. There was no observed increase in the frequency of checks in relation to the baseline phase, a fact that would impede even the identification of this instruction as having an autoclitic effect on the listener.

Ladouceur et al. (1997) extended the relevance of the data from their experiment for the analysis of some clinical phenomena, such as obsessive-compulsive disorder. Despite the explanatory circularity brought about in the causal cognition discussion (Skinner, 1953), the type of study proposed by Ladouceur et al. (1997) is thought-provoking and should therefore be revisited by experimental behavior analysts in future studies.

The experiment of Abreu and Hübner (2011) had some limitations due to the number of participants and the variability in the frequencies of checking responses. This fact would prevent the generalization of the obtained data. However, some behavioral regularities were found in both participants, such as an increased frequency of checks in Phase C (in relation to Phase B for Participant 1 and Phase A for Participant 2) and a decrease in the reversal phase. A methodology like the single subject may have the potential to specify which are the processes involved in controlling certain types of rules on checking responses (a study conducted by the first author as part of his doctorate, completed in February of 2013).

Verbal controlled behavior: an analysis of the effects of autoclitic verbal operants among choice behavior (Almeida, 2009).

In this same line of research verifying the effects of verbal antecedent stimuli with and without autoclitics and with announcement of aversive consequences, Almeida (2009) defended, in his doctoral thesis, that autoclitics can in an immediate and transient manner, change previously established response trends.

The work of Almeida (2009) intended to continue the discussion about the effects of inclusion of operant autoclitics in the control of the choice behavior among

minor and immediate reinforcing stimuli. The experimental situation was programmed in a design traditionally applied in self-control studies. After the installation of a pattern of preference for one of the alternative proposals, verbal control was investigated, with or without accompaniment of autoclitic operants, observing if it would generate the reversal, or not, of the pattern.

Method

Participants

Eight adults participated in the study, selected from students and staff of public and private universities in São Paulo. The participants were considered fluent readers.

Material and collection site

A notebook computer was used, equipped with a program specially designed for the study (programmed by Thomas Woelz, 2009), with the possibility of presenting written instructions, providing arrangements of stimuli and recording the performance of the participants. Four stickers of different colors (red, green, blue, and orange) were glued to the computer keys, indicating to the participants which keys should be activated during the game. To accomplish the task, the participants stayed in a room with a table and chair.

Procedure

The procedure was divided into two phases:

Phase 1: Installation of a Pattern of Preference for Minor/Immediate or Major/Delayed Reinforcing Stimuli in a Situation of Competing Choice.

The goal of this phase was to establish the participant's preference for one of the two reinforcing alternatives available in a choice task, in a typical situation of self-control designs in which two possibilities of choice are presented to participants: Two squares of different colors were prepared left and right of the computer screen.

Among them, the message "Choose between red (orange) and green (blue)" was presented.

In Phase 1.1, red and green color squares appeared on the screen, and pressure responses to the red key were followed by the presentation of minor and immediate reinforcement (five points, to be redeemed for cash after the session); responses on the green key were followed by the presentation of major and delayed reinforcement (10 points to be redeemed for cash after six weeks). In the second condition of this phase (Phase 1.2), the only planned change was in the colors of the squares and keys, which became orange (minor and immediate reinforcing stimulus) and blue (major and delayed reinforcing stimulus). The change of color in the two conditions was designed to ensure that the motor responses remained under the control of the visual stimuli, increasing the likelihood of the participant attending to instructions and other changes on the screen in later conditions.

For the closing phase, a preference criterion was stipulated from the choice of one of the reinforcement alternatives in 75% of the opportunities presented in a block of 20 attempts.

Phase 2: Presentation of Verbal Descriptions of Specific Content.

In this phase, participants were subjected to the same contingencies of competing choices as described in Phase 1. However, different verbal descriptions were presented before each choice, allowing the evaluation of the effect on the reversal (or not) of the pattern of preference previously established.

For all participants, in the ten initial attempts of Phase 2, there was no presentation of any kind of description about the choice responses. Such manipulation intended to evaluate the stability of the preference pattern established in Phase 1, which would clarify whether possible changes in this pattern could, in fact, be due to the introduction of different descriptions. From there, 30 other attempts of choice were programmed, preceded by the presentation of a verbal description of specific content. Three different description types were presented.

1) Verbal descriptions without autoclitics, which specified the emission of the opposite response to that established in Phase 1, without the accompaniment of operant autoclitics.

Thus, for participants who had demonstrated, in Phase 1, a preference for minor and immediate reinforcing stimuli (pressing the red and orange keys), the instruction "Press Green (or blue)" was presented. For participants who had shown preference for major and delayed reinforcing stimuli (pressing the green or blue keys), the description presented was "Press Red (or orange)."

2) Verbal descriptions accompanied by positive qualifying autoclitic operants, which positively described the opposite response to that established in Phase 1.

Thus, for participants who had shown preference for minor and immediate reinforcing stimuli (pressing the red and orange keys), the following description was presented: "Pressing Green (or blue) will be better." For participants who had shown preference for major and delayed reinforcing stimuli (pressing the green or blue keys), the description given was "Pressing Red (or orange) will be better."

3) Verbal descriptions accompanied by negative qualifying autoclitic operants, which negatively described the response established in Phase 1.

Thus, for the participants who, in Phase 1, had shown preference for minor and immediate reinforcing stimuli (pressing the red and orange keys), the following description was presented: "Pressing Red (or orange) will be worse." For participants who had shown preference for major and delayed reinforcing stimuli (pressing the green and blue keys), the description presented was "Pressing Green (or blue) will be worse."

All participants were submitted to the presentation of the three types of verbal description, as mentioned above, in ten sequential attempts for each type. This design allowed the assessment not only of the distinct control of each type of description on the pattern of choices of the participants but also of whether this control would be considered persistent or transient throughout the attempts.

A possible effect of the order in which the different descriptions were presented was controlled by the exposure of participants to the programmed conditions in different sequences. All the described conditions were presented in a single session.

Results

Figures 8a and 8b allow us to follow, on the y-axis, the participant's' choices on each attempt as well as the time for the emission of the response (TER) of choice. The x-axis describes the different conditions presented to the participants during Phases 1 and 2. In these figures, short bars indicate the choice for minor and immediate reinforcement in an attempt while long bars indicate the opposite choice. A solid line cuts the figure vertically, indicating the change from Phase 1 to Phase 2. To the left of the line are arranged the data referring to the establishment of preference and the necessary blocks to achieve the stipulated criterion in Phases 1.1 (Red/Green) and 1.2 (Orange/Blue). To the right of this line are arranged results indicating the effect of the introduction of verbal descriptions on the reversal or not of the established pattern. Dotted vertical lines indicate change of blocks. The frequency polygon fully horizontally cutting the figure represents the time spent to emit the choice response (TER- time for the emission of the response) in each attempt in the different experimental phases.

Figure 8a shows the data of the participants whose stated preference pattern was for minor and immediate reinforcing stimuli, and Figure 8b shows those whose preference was for major and delayed reinforcing stimuli.

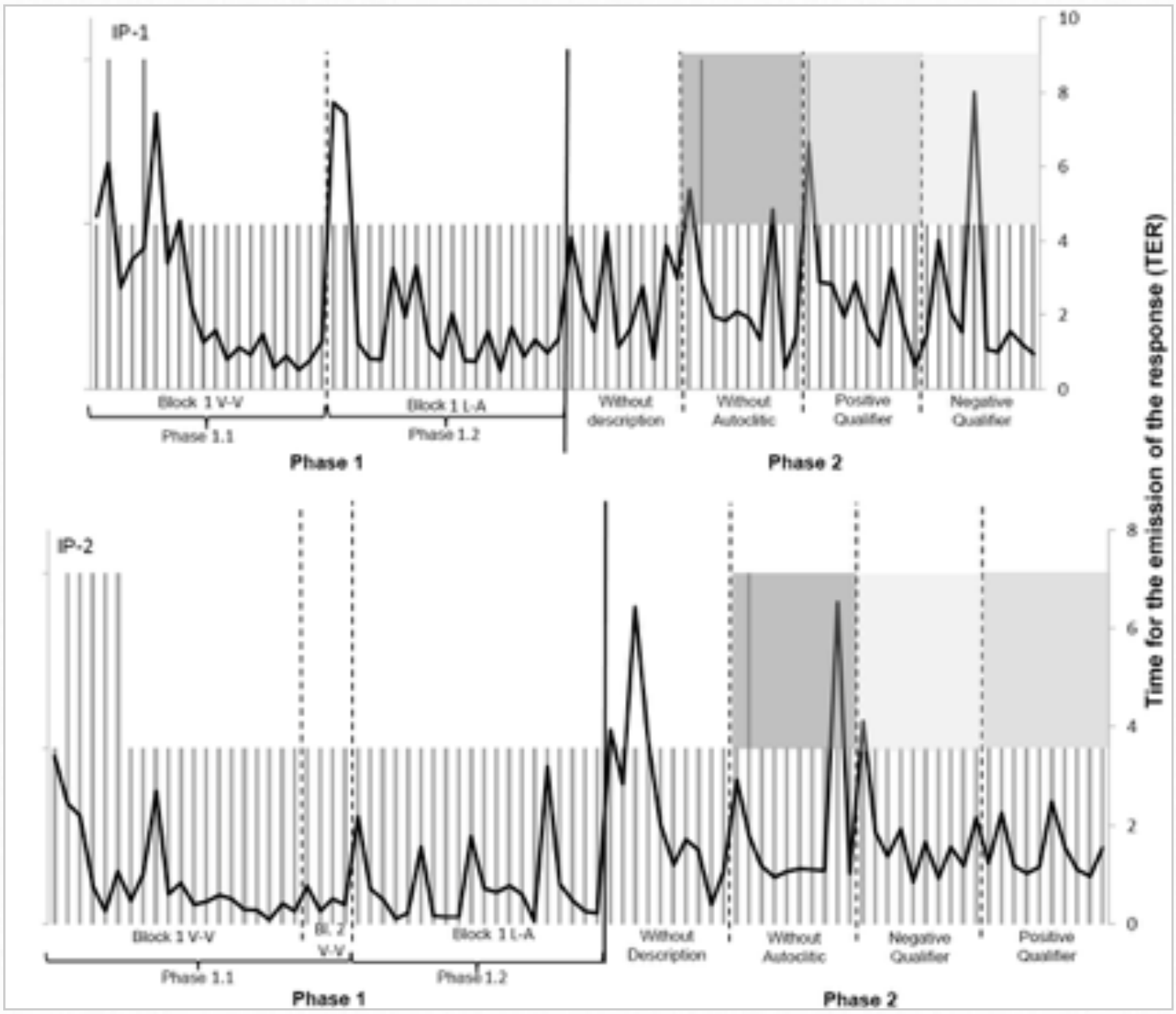

Figure 8a. Choice of minor and immediate reinforcing stimulus and time of emission of response (TER) in seconds of Participants IP-1 and IP-2 for each attempt. The colors in the background indicate the type description presented (dark gray = without autoclitic; medium gray = positive qualifier, light gray = negative qualifier); the area of colors indicates that the participant's responses were under the control of the description (extracted from Almeida, 2009).

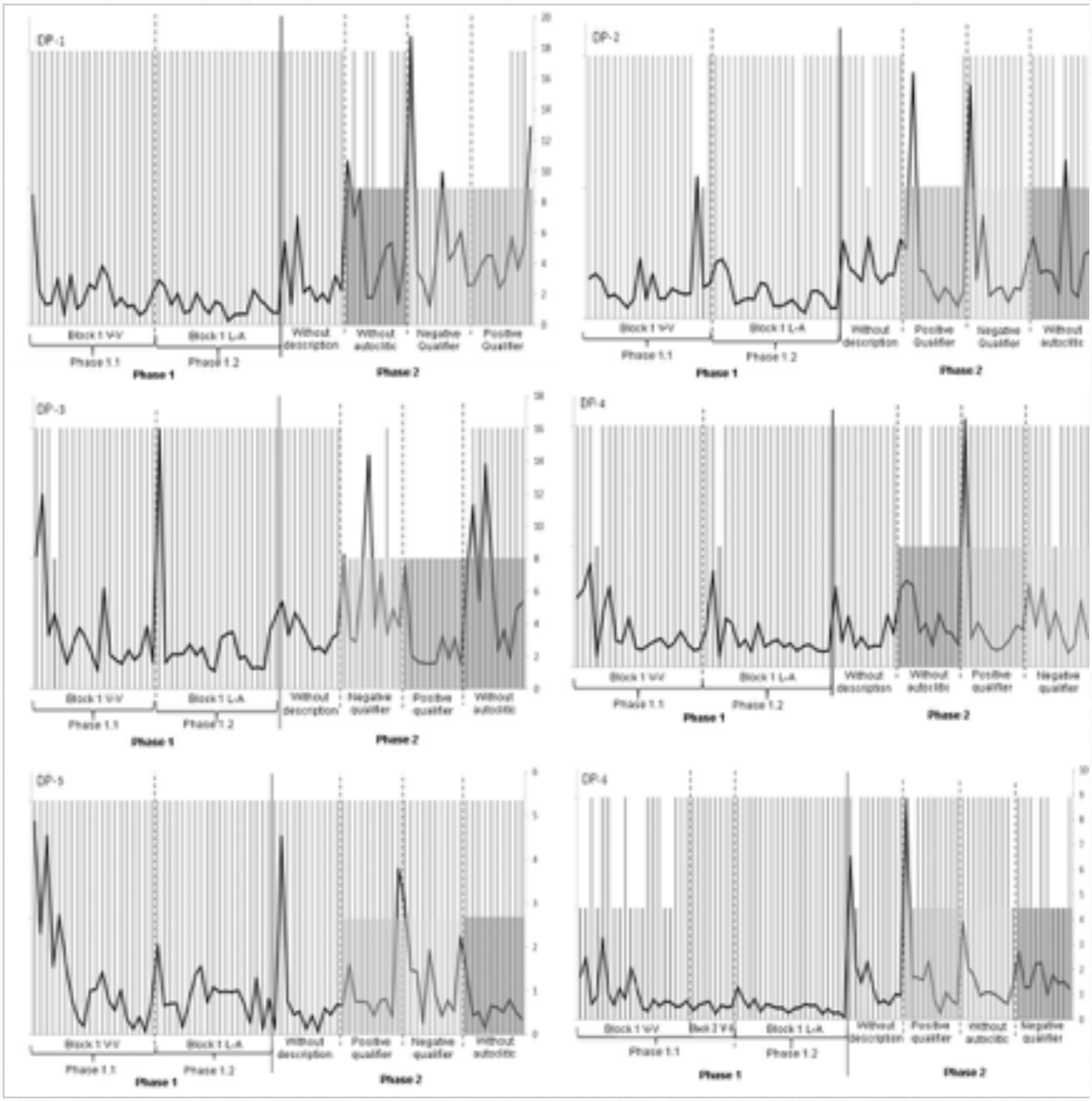

Figure 8b. Choice of major and delayed reinforcing stimulus and time of emission of response (TER) in seconds of Participants DP-1 to DP-6 in each attempt. The colors in the background indicate the type of description presented (dark gray = without autoclitic; medium gray = positive qualifier, light gray = negative qualifier); the area of colors indicates that the participant's responses were under the control of the description (extracted from Almeida, 2009).

Among the eight participants, two showed preference for minor and immediate reinforcing stimuli (IP-1 and IP-2) and six for major and delayed reinforcing stimuli (DP-1, DP-2, DP-3, DP-4, DP-5, DP-6) at the end of Phase 1. Independently of the direction of the established preference, it should be noted that the pattern of responses from participants was under the strong control of differential consequences promoted by the different choices, both in the direction of immediacy (IP-1 and IP-2) and in the direction of the greater magnitude of reinforcement (DP-1, DP-2, DP-3, DP-4, DP-5, DP-6).

With the introduction of the descriptions, the reversal of the pattern established in Phase 1 was observed in only three of the eight participants, all of the group that initially showed a preference for major and delayed reinforcement (DP-1, DP-2, DP-3). The other participants showed no reversal of preference with little or no observed alternation in the direction suggested by the descriptions.

Only in the case of DP-6 it was noted that the inclusion of negative qualifying autoclitics seemed to have favored the following of the presented instructions, although the reversal criterion has not been attained.

When considering the results of the three participants who presented reversal, it is noted that verbal operant autoclitics appear to have favored the control of the descriptions on the responses of choice, certainly in the case of Participants DP-1 and DP-2 and in DP-3 more transiently. For DP-1, the inclusion of negative autoclitic qualifiers favored the choice of the alternative of minor and immediate reinforcement in all the attempts presented and in seven attempts in which positive autoclitic qualifiers accompanied the description. Without a qualifier, only four attempts were in the direction specified by the description.

Note, in the case of DP-2 and DP-3, the greater effect of the descriptions on the responses of choice at the beginning than the end of Phase 2, coinciding with the conditions under which the autoclitics were presented.

When compared to the control exercised by different autoclitics, it is noted that the type of qualification presented did not appear to exercise a particular control over the response of choice. In the case of DP-1, negative qualifiers appeared to exert greater

control than the positive ones over the responses of the participant while, in the case of DP-2 and DP-3, the opposite has been observed. Therefore, more importantly than the type of qualifier, the presence of autoclitics appears to interfere with the pattern of choice.

The effect produced by the presentation of autoclitic qualifiers on the pattern of choices of participants can also be considered from the analysis of the time for emission of response (TER) of choice after the presentation of the different descriptions. Note that, for five (IP-1, DP-1, DP-2, DP-4, DP-6) of the eight participants considered, major peaks of TER were observed in the presence of qualifiers. Higher TER indicates higher latency in the response and, therefore, that some interference occurred from the descriptions.

Among the other participants, except for DP-5, the introduction of descriptions favored the emission of at least one response in the specified direction, even in the absence of an autoclitic qualifier. Here, verbal control shows itself to be transitory, and a return to the preference pattern previously established in the other attempts of Phase 2 was observed.

Discussion

Concerning the reversal of the initially established preference, the data seem to show that the introduction of descriptions, especially when accompanied by autoclitic qualifiers, is more likely to alter the pattern of choices for major and delayed reinforcing stimuli than for minor and immediate reinforcing stimuli.

According to Mallot (1989), the preference for minor and immediate reinforcing stimuli can be understood as resulting from control by a direct contingency that produces immediate results of great magnitude and probability. Previous studies indicate that the control established by direct contingencies can be considered superior to that established by verbal contingencies, particularly when the direct control of the response has been demonstrated before the introduction of verbal descriptions. The results of Almeida (2009) agree with previous data described in the literature since the introduction of verbal descriptions did not lead to the reversal of performance among members of the group whose initial preference was for minor and immediate reinforcing stimuli, even when the descriptions were accompanied by autoclitic qualifiers. They also corroborate, in some

form, the analysis of Torgrud and Holborn (1990), which highlights the greater effect of verbal behavior on the non-verbal under conditions in which the discriminative control is lower, which occurs in the so-called indirect contingency of Mallot (1989).

The presence of autoclitics may constitute a condition that causes a temporary control and reversal in the pattern: The descriptions were followed at least once by the participants. The transience observed in the present study of verbal control in the face of local contingencies that favor the emission of responses in the opposite direction agrees with the literature of different studies in the area (Galízio, 1979; Torgrud & Holborn, 1990; Amorim, 2001).

Together, the results seem to suggest the greater probability of altering, via verbal control, patterns of behavior maintained by contingencies of major and delayed reinforcing stimuli than those maintained by contingencies of minor and immediate reinforcing stimuli.

When these habits produce immediate reinforcement (smoking, eating, drinking), conversations can be inefficient in reversing our pattern of responses, but on the other hand, even if we are determined to continue a behavior that produces delayed reinforcement (for example, dieting), advice in the opposite direction, even once, can easily make us give up ("today doesn't matter," "just a little bit").

Thus, it can be said that, in some situations, verbal control can induce our behavior in emphasizing one or another aspect of a situation.

Therefore, we continue to further the research of the conditions that limit or facilitate such control from the way speech is organized.

Effects of autoclitic manipulation in stories on the non-verbal behavior of children (Gomes, 2015)

Valdivia, Luciano, and Molina (2006) tested the persuasive effect of stories and then the effect of reverse persuasion with the strategy employed in Acceptance and Commitment Therapy, called "deliteralization." The authors conducted two experiments

involving manipulation of verbal protocols and the reported effects on children of six to seven years as well as on the alteration in their non-verbal behavior.

In the first experiment, the researchers used a thirst-inducing protocol to verify its reported effect on verbal (thirst) and nonverbal (consuming water) behavior in five children aged six years old. The second experiment had the objective of replicating the effect of the first experiment with a different "motivational state"—in this case, physical restriction—by means of a new implementation protocol. Furthermore, the authors tested what they called "decontextualization" (or deliteralization) with a thirst-inducing story (removing the cohesion of the story, truncating it with phrases like, "How many syllables does the word ‘desert’ have?” In other words, they changed the stimulus control).

These protocols consisted of a story that suggested that the participant imagine a situation in which he felt very hot, and, as the story proceeded, more suggestions of heat were added with the use of modulations in the tone of voice and illustrative gestures of the situation suggested by the story. The protocol of "decontextualization" does not possess the same verbal arrangement.

In both experiments, the protocol "contextualized" presented results that indicate a persuasive function of verbal arrangement: When "contextualized," the protocol presented a persuasive effect, although, when "decontextualized," it did not show the same effects.

The authors argued that the arrangement of a series of coordinated words with the function of thirst or physical restraint and presented in a context suggesting that the situation is happening with the child is probably responsible for verbal changes in the accounts of the children. Thus, the presentation of the arrangement of the words contained in the stories exerts "different motivational functions."

A systematic replication of the research of Valdivia, Luciano, and Molina (2006) was performed by Gomes (2015), who analyzed whether a part of the reversal of the effects could be related to non-manipulation of the same autoclitics in the two tested protocols, something not considered as a critical variable by the authors of the first study. The research of Gomes (2015) aimed to investigate the effect of vocal verbal

stories with deliberate manipulation of different types of autoclitics on non-verbal responses of children aged six to sete years old.

Method

Participants

Nine children participated in the research of Gomes (2015): six girls and three boys aged between six and seven years old, all students in the same class in the first year of a private school in a municipality in the interior of the state of São Paulo. One of the children only participated in the sessions with Verbal Protocols of Itching.

Materials and Location

The data collection sessions took place in the school where the participants studied in two rooms arranged identically with a chair for the participant, two video cameras mounted on tripods—one directed at the researcher and the other directed at the participant—and a shelf, normally used for sheet music, turned to the researcher and close to him/her, containing the sheets for the researcher to read with the respective protocols (stories) used in the research.

Experimental Design and Procedures

An intra-subject design was employed of alternating treatments with replications between participants in two different situations, each involving a type of verbal story spoken by the researcher, known as verbal protocols. First, the Verbal Protocols of Physical Restriction were applied over nine individual sessions, and after an interval of approximately two months, nine individual sessions were employed using the Verbal Protocol of Itching. The story (protocol) of physical restriction related to a situation of a supposed imprisonment of the child in a box with difficulty in stretching, which increased with time. In the story of itching, a supposed condition of head lice was presented to the child, which itched more and more.

Each category of the Verbal Protocol, *Physical Restraint and Itching*, was divided into three variations, each applied an Experimental Condition of an alternating form

(Condition A — Standard Verbal Protocol; Condition B — Verbal Protocol with Autoclitic Manipulation; Condition C — Verbal Protocol with Autoclitic Manipulation and Discontinuation, inserted only in the third version of the Protocol [Condition C]). In short, in Condition A, the story was reported without highlighting autoclitics (gestures and voice modulation) and without discontinuity of the story. In Condition B, there was the introduction of gestures and voice modulation, and in Condition C, the gestures and voice modulation were maintained, but there were excerpts of discontinuity in the stories.

The order of application of the Verbal Protocols (Experimental Conditions) throughout the sessions were semi-random so that the same condition was not repeated over two consecutive sessions, and each one occurred three times over nine experimental sessions. Table 1 shows the order of the Experimental Conditions employed for the Verbal Protocols of Physical Restriction and Itching.

Table 1. Experimental conditions applied throughout the sessions.

Session	1	2	3	4	5	6	7	8	9
Experimental Condition (Physical Restriction Protocols)	C	A	B	A	C	A	B	C	B
Experimental Condition (Itching Protocols)	A	B	B	A	C	C	A	C	B

Note: (A) Standard Verbal Protocol, (B) Verbal Protocol with Autoclitic Manipulation (C) Verbal Protocol with Autoclitic Manipulation and Discontinuation.

In general, there were three experimental sessions per week with each participant on consecutive days. There were exceptions, particularly in sessions in which the Verbal Protocol of Itching was employed, due to the lack of participants at the school and restrictions imposed by school events.

The data collection took place during class time, when the researcher sought out the participant individually in the classroom and led him/her to the data collection

environment. Once there, the researchers asked the participants to sit down, started the two video cameras recording, positioned themselves in front of them, and began to tell the story, using the appropriate verbal Protocol, according to the planned order of the Experimental Conditions. At the end of the story, the researcher began the implementation of a Protocol of Understanding with questions aimed at identifying whether the participant had understood the story. After this stage, the researcher thanked the participant for his/her assistance and returned him/her to the classroom. Each session lasted approximately five minutes.

Results and Discussion

Using the Protocol of Physical Restriction and variations of it, the results of Gomes (2015) showed that, for four of the eight participants, Conditions B and C were substantially more effective in controlling evasive behavior while maintaining higher response rates of this type than in Condition A in all (P1 and P7) or in the majority of sessions (P2 and P5). For these participants, the discontinuation of excerpts present in the story did not reduce or abolish the effectiveness of other autoclitic manipulations, differing from the results presented by Valdivia et al. (2006), possibly because the autoclitics of voice modulation and gestures were maintained.

For the other participants in Experiment 1 of Gomes (2015), there was greater variability in the data, and the autoclitic effects seem to have been more transitive, matching the effects produced by the condition without autoclitic manipulations used in part of the sessions. However, despite the variations observed in the data of these participants, the conditions that employed autoclitic manipulations arising from the discontinuation of excerpts seem to have had more effect on the non-verbal responses of participants than the other conditions, indicating that the breaks in continuity did not abolish or weaken the effects of the other verbal operants, both primary and secondary.

In Experiment 2 of Gomes (2015), there was a lot of variation in the frequency of non-verbal responses from participants in the face of all the experimental conditions. However, for all the participants in Experiment 1 and for six in Experiment 2, the story with autoclitic manipulation arising from discontinuation of excerpts exerted an effect similar to or greater than the story without the discontinuation of excerpts, both being more effective than the simple story without any of those characteristics. Gomes (2015)

argues that these results show that the use of qualifying, quantifying, relational, manipulative, and composition autoclitics was responsible for increasing the effectiveness of stories in controlling the non-verbal behavior of these participants.

Thus, Felipe Pereira Gomes (Master's student of LEOV), Luis Antonio Lovo Martins (Master's student), Sidinei Rolim (Master's student), and Andréa Callonere (PhD student) conducted, under my supervision, the addressed research.

Final Considerations

The emphasis on the manipulation of verbal antecedent stimuli and verification of their control over the response that follows it only indicates that we are investigating procedures of antecedent stimulus control of the verbal type, also known as verbally governed behaviors.

The reinforcing consequence, however, is essential, because we are dealing with operants. The more precise the verbal control, the higher the level of specification that it involves, but without the consequence of the reinforcing stimuli, the verbally controlled response extinguishes itself.

As Skinner (1957) affirms, the three terms of the contingency are essential. The effect of the consequence is not magic, just as it is not the effect of the antecedent.

However, taking advantage of the benefit that we are verbal beings with a probable history of rule following, procedures can be planned that, through verbal behavior, increase the likelihood that relevant behaviors occur.

Whether the speaker was the experimenter or the participant him or herself, the isolation of this variable is still a challenge to be faced. The doctoral thesis data of Eduardo Cillo (Cillo, 2011) revealed no differences between self-talk shaped or instructed by the experimenter, which gives us clues of responses.

The effects of the verbal antecedents manipulated here are clearer in children than in adults, consistent with the literature on the correspondence between verbal and non-verbal behavior (Ribeiro, 1989). Such consistency, in our view, reveals that we investigated a phenomenon for which we obtained generality in different ways and with diverse designs.

The path we choose for ongoing research seeks to deepen the explanation or clarification of the process underlying the persuasive effect of verbal antecedents, and we invest in the process involved in the formation of equivalence classes, as, in our view, non-verbal control installed by a verbal antecedent is only possible if the words and events involved in the mand are part of the same class — in other words, only if tacts have been installed — and for tacts to be installed, one of the processes may be the formation of equivalence classes (pairing word-event/object). However, the difficulty is that there are two areas of little dialogue and different emphases. Skinner (1957) does not deviate from three-term contingency, and Sidman (1994), in proposing relationships of equivalence, suggests four and five term contingencies and emphasizes the stimulus to stimulus relationship. We think, however, that the verbal phenomenon is a symbolic phenomenon, and its full understanding will have to involve the notion brought to the table by the equivalence paradigm. The methodological approaches are different, but we insist on the search for a meeting point, for dialogue. On the other hand, we understand that the proposed paradigm still does not attain a cohesive and linked understanding of the autoclitic subtleties of complex texts.

Although, in the context of experimental behavior analysis, we have always been, ultimately, in search for motivational procedures that contained shortcuts—shorter, more effective paths, which would increase the reinforcing value of the requested action — we believe we can find in the autoclitic this function advocated by Skinner (1957). In that it made the effect on the listener more accurate, it worked for the majority of participants with a small adjustment, an additional control.

We conclude that the autoclitic is more a dimension of stimulus control, and we agree with the analysis of Schingler and Blakely (1987) and Schingler (1993) that it can be a function-altering stimulus, especially when it announces positive reinforcing contingencies. We are, therefore, back to the good old behavioral principle. Without positive reinforcing stimuli, all the desires controlled by the antecedent stimuli become "words to the wind." Many were in the studies presented here and are in our own lives.

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3 Methodological considerations for the study of reoccurrence of conditional responses after extinction in humans[1]

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Abstract

The literature on classical conditioning indicates that the extinction of conditional responses (CRs) is not permanent and that these responses may reoccur in different situations. Recent studies showed that CRs did not reoccur when extinction was preceded by an isolated presentation of a conditioned stimuli (CS). This isolated CS presentation was shown to prevent CR occurrence when conducted within an interval between 10 min and 6 h before the extinction procedure. In human studies, however, attempts to replicate these findings have yielded mixed results. The aim of this review was to systematize some of the features of the extinction procedures described in the literature on human subjects and their respective results regarding to CR reoccurrence. Some variables possibly associated with long-term extinction or other variables that have not yet been systematically tested are discussed, including the pre-experimental characteristics of the participants, the nature of the CSs, the similarities or differences between conditioning and extinction contexts and the activities engaged in during the extinction intervals (specifically those involving verbal behavior). We conclude that systematic manipulation of these variables is necessary to understand the mechanisms that control CR reoccurrence after extinction.

Keywords: classical conditioning, extinction, reoccurrence.

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1. Introduction

This paper focuses on studies of classical conditioning involving aversive stimuli in humans. The typical experiment used to study this process involves the pairing of neutral stimuli (such as images) with an unconditional aversive stimulus (US, usually an electric shock). As a result, these images become conditioned stimuli (CSs), i.e., they acquire the function of eliciting a wide range of conditional responses (CRs), such as changes in the electrical conductance of the skin, (Graeff, Parente et al., 2003; Schiller et al., 2008; Schiller et al., 2010). The CS may lose this eliciting function if it occurs repeatedly in the absence of the US, a procedure named extinction[3] (Monfils et al., 2009; Pavlov (1927).

The literature has given marked attention to extinction of aversive classical conditioning because of the possibility of its transposition to applied situations. Some human disorders, such as anxiety or acquired fears, are thought to involve aversive conditioning processes and are treated using clinical approaches based on extinction (Davis et al., 2006; Hermans et al, 2006). One such example is exposure therapy, which brings the subject into contact with stimuli (CSs) related to a traumatic situation experienced (US), but in the total absence of the US. Gradually and systematically, the CR (i.e., the symptoms that are being treated) decreases until it ceases to be elicited by the CSs (Powers et al., 2010; Rachamin et al., 2009). One limitation of exposure therapy is that after extinction the CSs may recover their function to elicit CRs (Bouton, 2002). This effect, called *reoccurrence* (Barlow, 2002; Foa et al., 2002), reduces the effectiveness of therapy and brings a challenge to understanding the basic processes involved in extinction.

To investigate the possible variables involved in CR reoccurrence is a way to better predict and control this process. Recent studies suggest CR reoccurrence may be prevented if extinction is preceded by an isolated presentation of a CS (Monfils et al.,

3- In the literature, the term “extinction” has been used to refer to either a procedure (the presentation of the CS without the US after conditioning) or a process (the progressive reduction of the magnitude of the CR due to this procedure) (Catania, 1999; Lattal and Lattal, 2012). In the present text, if not specified otherwise, the term is used as a synonym for the procedure.

2009; Schiller et al., 2010). The isolated CS presenting is shown to prevent CR occurrence if it is conducted within an interval between 10 min and 6 h before the extinction procedure. However, attempts to replicate this effect, which has been termed by some authors as “post-retrieval extinction” (Kredlow et al., 2016), have produced no systematic results.

To identify the variable, or set of variables, that can systematically be part of the procedure that produce endure extinction in basic research with humans is an important aim to classical conditioning area. One way to do that is to compare the procedures that replicate or not replicate the researches that reported no reoccurrence in the laboratory studies, trying to find the relevant variables that produce each kind of result. Here, we try to systematize some few variables that apparently are not being used similarly in different studies about the reoccurrence effect in humans. Some variables possibly associated with long-term extinction or other variables that have not yet been systematically tested are discussed, including the pre-experimental characteristics of the participants, the nature of the CSs, the similarities or differences between conditioning and extinction contexts and the activities engaged in during the extinction intervals (specifically those involving verbal behavior). In order to conduct this systematization, we must first evaluate the basic procedure for the study of CR occurrence.

2. Basic procedure for the study of CR reoccurrence

The basic procedure to study CR reoccurrence involves three phases: conditioning, extinction and testing. In conditioning, the subject is exposed to pairings of the US with the neutral stimulus until it becomes a CS. In the extinction phase, the subject is exposed repeatedly to the CS (without the presentation of the US) until the CR no more be elicited by it. In the test phase, the subject is again exposed to the CS without the US: if the CS elicits the CR, this result indicate that the extinction is no more effective, and the effect is named reoccurrence; if there is

no such elicitation, the extinction procedure is considered enduring (Schiller et al., 2008; Schiller et al., 2012).

Variations in the basic procedure has been used, like longer interval between extinction and test phases (Norrholm et al. 2008; Schiller et al., 2008) or test in the environment with different physical characteristics (location of experimental room, color of the walls, furniture, the presence of a different experimenter, or different background on which visual stimuli are presented) than the setting in which the extinction procedure was performed (Alvarez et al., 2007; Effting and Kindt, 2007; LaBar and Phelps, 2005; Milad et al., 2005; Neumann and Longbottom, 2008; Schiller et al., 2008). Another variation is re-exposure the US before testing (Milad et al., 2005; Schiller et al., 2008). As a result of all this basic procedure and its variations, the CR has been observed to reoccur.

3. Experimental designs that reduce CR reoccurrence

One procedure described as able to prevent CR reoccurrence had its origins in studies that experimentally induced retrograde amnesia in rats to investigate the neurophysiological and cellular processes related to learning (for a review, see Sara, 2000). It involves three stages similar to the basic procedure described above but with variations in the second phase, specifically imposing a longer interval between the first CS and the others. For example, Monfils et al. (2009, Experiment 1) exposed rats to pairings between a tone (CS) and shock (US) and used freezing as CR measure. Twenty-four hours later, the animals underwent an extinction procedure in which the CS was presented 19 times without the US. The length of the interval between the presentation of the first CS and the others varied across the five groups: 10 min (Group 1), 1 h (Group 2), 6 h (Group 3), 24 h (Group 4) and no interval, i.e., a CS every 180 s (Group 5). With the exception of this last group, the other rats were removed from the box after the first presentation of the CS and returned to their cages, where they remained during the

established interval, after which they were taken back to the experimental box to finish the extinction procedure. Subsequently, two tests of CR reoccurrence were conducted, 24 h and one month after the extinction. The results showed that none of the subjects exhibited a reoccurrence of CRs when the CS was presented 24 h after extinction. After one month, however, only subjects from Groups 1 and 2, whose manipulated interval during the extinction procedure was 10 min and 1 h, respectively, showed no CR reoccurrence; all remaining subjects presented freezing again in the presence of the CS. Similar results were obtained in other experiments described by Monfils et al. (2009, Experiments 2, 3 and 4), in which various other alterations were made. These results showed that, with rats, the interval from 10 min to 1 h between the first CS and the remaining ones in the CS presentation at the second phase (without the US) produces an enduring extinction process, i.e., the CR is not elicited by the CS for a long time after extinction.

The first to adapt the procedures from Monfils et al. (2009) to human subjects was Schiller et al. (2010), who used two colored squares displayed on a computer screen as CSs, an electrical shock as US, and skin conductance responses as the measure of CRs and URs. Participants were exposed to the conditioning, extinction and testing phases. In the first phase, only one of the squares was paired with shock in 38% of trials (CS+), while the other square was never paired with the US (CS-). In the second (extinction) phase, participants were divided into three groups (10 min, 6 h, and no reminder groups) according to the procedure employed. All groups were exposed to 11 CS+ and 11 CS- without the US, randomly distributed with an average interval of 11 s between presentations. Two groups (10 min and 6 h Groups) were exposed to an isolated presentation of the CS+, followed by an interval of 10 min during which they watched an episode of a TV program previously selected by the researchers. After this interval, the 10 min Group received the remaining CSs. The 6 h group received the same treatment as the 10 min Group but extinction was conducted 6 h after the isolated presentation of the CS. The remaining group (no reminder group) started the

session watching the TV program for 10 min. For half of these subjects, extinction followed immediately after this 10 min period; for the other half, extinction was conducted 6 h after watching the TV show. In the third phase, all the participants were exposed to 11 presentations of each CSs (average interval of 11 s between presentations). The results at the last session showed that the CR was elicited by the CS+ to a lesser extent among subjects exposed to the 10 min interval than the other groups. This result was maintained after one year, when 19 of the 65 original participants underwent a new test that consisted of four unsignaled presentations of the US, followed by a new extinction procedure.

Schiller et al. (2010) conducted a second experiment to assess the specificity of CR extinction with the procedure tested in their first experiment, i.e., to test if interfering with the eliciting function of one CS would affect the elicitation of another CS associated with the same US. In this second experiment, three CSs (colored squares) were used in a within-subject design: in conditioning phase, two of three squares (CSa+ and CSb+) were paired with the US (in 38% of presentations), and the third was never paired (CS-). On the second day (extinction phase), all of the participants were exposed to 11 presentations of each of the three CSs without the US: one CSa+ and CS- were presented, followed by a 10 min interval, during which participants watched an episode of a TV program; after this interval, the participants were exposed to more ten isolated presentations of CSa+ and CS- and 11 presentations of CSb+. The testing on the third day involved the presentation of four USs, followed by a 10 min interval, during which participants watched the same television episode as on the previous day. After this interval, subjects were exposed to 11 presentations of the three CSs, and the CR occurrence was registered. The results showed that in the conditioning and the extinction sessions, both CSs+ had similar function: both elicited the CR at the end of the conditioning session, and both had this eliciting function equally suppressed at the end of extinction session. In the testing phase, however, the

results showed lower reoccurrence of the CR in the presence of the CSa+ than in the presence of the CSb+.

This set of results suggests that the extinction process can be enduring and that the interval between the first and the remaining CSs in the extinction procedure might be the relevant variable that affects the duration of CR extinction. They also suggest that this effect can be specific to the CS which interval between the first and remaining presentations is manipulated.

4. Some conflicting results and methodological considerations on them

The studies of Schiller et al. (2010) triggered the search for the replication of the enduring CR extinction in humans in several laboratories. However, the results obtained with human subjects are mixed. Some studies reported enduring CR extinction, i.e., no reoccurrence (Agren, Engman et al., 2012; Liu et al., 2014; Oyarzún et al., 2012; Schiller et al., 2013). In contrast, Drexler et al. (2014), Golkar et al. (2012), Kindt and Soeter, (2013), and Soeter and Kindt (2011) observed CR reoccurrence even after manipulating the interval between the CSs during extinction.

This disparity in the results suggests that the extinction procedure used in humans studies, in which the interval between the CSs is manipulated, may be sensitive to subtle methodological differences that need to be evaluated systematically. Also, the procedures utilized may involve other variables that have not yet been identified but may be responsible for the different effects reported. In what follows, we analyze six possible variables that could be experimentally manipulated in order to better understand the phenomenon: pre-experimental characteristics of the participants, the nature of the neutral stimulus, the nature of the first stimulus presented in the extinction phase, the setting in which the three

phases of the experiment were conducted, the activities the participants engage in during the CSs interval, and the predictive power of CS+ and CS-.

Considering the pre-experimental characteristics of the participants, a recent meta-analysis of experiments that tried to replicate Schiller et al. (2010) findings did not find a relation between the age and gender of participants and the direction of the results (Kredlow et al., 2016). However, there are other characteristics of the samples that could not be analyzed, namely, the presence of psychiatric disorders. Lissek et al. (2005) found evidences that individuals with anxiety disorders present increased classical conditioning and take longer to stop responding to conditional stimuli during extinction procedures than subjects without these diagnoses. There is also a positive correlation between chronic anxiety level, as measured by verbal report (named “trait anxiety”, as in Kindt and Soeter, 2013; Spielberger et al., 1970), and the increase in skin conductance responses when CS- is presented in the context of uncontrollable and unpredictable shocks (Kindt et al., 2009; Soeter and Kindt, 2010). Especially important to the present analysis is the Agren, Furmak et al. (2012) report that, using the procedure suggested by Schiller et al. (2010), found that individuals that carried polymorphisms in genes encoding the production of serotonin and dopamine showed the enduring CR extinction more frequently than those that did not carry these polymorphisms.

Despite the knowledge that some pre-experimental characteristics of participants could alter the results of this type of study, the participant selection has not been standardized across experiments. Most studies that obtained long lasting CR extinction did not mention specific criteria for the selection of their subjects (Agren, Engman et al., 2012; Agren, Furmak et al., 2012, Golkar et al., 2012; Liu et al., 2014; Oyarzún et al., 2012; Schiller et al., 2010). Others that obtained CR reoccurrence using the same extinction procedure reported having an initial participant screening to ensure a homogeneous sample, excluding potential

participants with anxiety disorders and specific phobias (Kindt and Soeter, 2013; Soeter and Kindt, 2011) or those who used medications because of psychiatric or neurological indications, used drugs (Schiller et al., 2013). So, these data suggest that one possible source of the diverse results may be the pre-experimental characteristics of the population used in the experiments. More systematic research needs to be conducted in order to identify the limits of these variables.

Other set of relevant variables can be the nature of the neutral stimulus (i.e., the stimulus that originally does not elicit the response under study) paired with the aversive US. The comparison of studies suggested that different magnitudes of conditioning and extinction can be obtained depending on the stimulus used. For example, Öhman et al. (1976) reported that pictures of spiders quickly acquire the CS function and elicit CRs that are more resistant to extinction than pictures of mushrooms, flowers or geometric shapes. Based on these experimental data, Kindt and Soeter (2013) replicated the procedure used by Schiller et al. (2010) in Experiment 2 using pictures of spiders as the CS instead of colored squares. In a more recent study, Drexler et al. (2014) utilized pictures of animals with aggressive appearance such as dog, spider, shark, snake, and tiger, and observed CR reoccurrence after extinction, i.e., did not replicate the Schiller et al (2010) results. These data could suggest that the nature of the CS would explain the divergence of the results reported. In fact, in Kredlow et al. (2016) meta-analysis, the effects were moderated by CS type (fear-relevant vs. fear-irrelevant), with results replicating Schiller et al. (2010) with fear-irrelevant stimuli. However, the fear-relevancy of the stimuli does not alone explain variation in results: Golkar et al. (2012) observed CR reoccurrence when using faces of fear as well as colored squares as CSs. So, despite the fact that the nature of the CS be a very important variable to produce classical conditioning and extinction, it does not seem to explain alone the divergence of the reoccurrence results. Further comparative studies evaluating the interference potential of this variable would be important contributions to this area of study.

Another variable to be considered is the nature of the first stimulus presented before the time interval in the extinction phase. In most studies the isolated presentation of the first CS, with a minimum interval of 10 min before the presentation of the other CSs, was the standard procedure (Agren, Engman et al., 2012; Drexler et al., 2014; Golkar et al.; 2012; Kindt and Soeter, 2013; Oyarzún et al., 2012; Schiller et al., 2010; Schiller et al., 2013; Soeter and Kindt, 2011). The only exception is Liu et al. (2014), who showed the same enduring extinction effect by presenting the US before the 10 min. Liu et al. (2014, Experiment 2) paired two images (CSa+ and CSb+) with an electric shock (US). After 24 h, the extinction procedure was performed: one of the CSs+ was presented in isolation to one of the groups prior to the 10 min period; to another group, only one US was presented prior to this period, followed by the CSs; a third group underwent a CSs presentation without manipulation of the interval between them. In the test session, no CR reoccurrence were found in the groups exposed to the CS+ and to the US before the interval showed, while the third group showed reoccurrence.

The studies analyzed here suggest that in order for the extinction procedure to produce long lasting effects it is necessary to make an isolated presentation of the CS (or US), followed by an interval between 10 min and 6 h, an then by successive presentations of the CS in the absence of the US (Agren, Engman et al., 2012; Drexler et al., 2014; Golkar et al., 2012; Kindt and Soeter, 2013; Liu et al., 2014; Oyarzún et al., 2012; Schiller et al., 2010; Schiller et al., 2013; Soeter and Kindt, 2011). From a behavioral point of view, this extinction procedure has at least three aspects that should be taken in consideration: 1) the temporal interval between the isolated presentation of the CS (or US) and the remaining presentations of the CS without US; 2) the context where subjects remain during this interval; and 3) the activities the subjects engage in during the interval. These aspects can be a stimulus composed of several elements that may be effective when presented together but it is possible that some parts of it are more effective than others.

In the original study conducted with rats (Monfils et al., 2009), after the presentation of the first CS in the extinction phase, the rats were removed from the experimental box, left in their home cages throughout the scheduled interval and later brought back to the experimental box, where they were exposed to the subsequent presentations of the other CSs. Therefore, during the interval manipulated in the extinction procedure, the subjects remained in a setting that was never paired with the US. In studies with human subjects, this manipulation varied in the extinction sessions across studies. For example, in the study by Schiller et al. (2011), after participants were exposed to the first CS, they were disconnected from the devices and watched a television program in the same room in which the experiment was conducted. Conversely, in Kindt and Soeter (2013), during this interval, the participants were moved to an adjacent room, where they read magazines. When Schiller et al. (2010, Experiment 1) used an interval of 6 h, it was reported that during the first 10 min, participants watched a television program in the experimental room, but no information was given about where they were or what they did for the remainder of the 6 h interval between the first CS and other CSs. In addition to this change in the environment, the lack of information about the activities performed by the participants during this interval in the extinction phase is a general feature of these studies. The content of the television programs and magazines is also not described. If the participant did not want to read or watch the program, were they allowed to engage in another activity?

Research has shown that control of behavior by antecedent stimuli has multiple variations depending on the configuration of the stimulus (Dube et al., 2010; Dube & McIlvane, 1999; Reynolds, 1961). For example, when using discriminative training with compound stimuli (such as shape, color and texture), research shows that these different characteristics of the stimulus may control behavior differently, some of which may be irrelevant, others may be more potent in this control or even in the controls exercised by them. Therefore, when using the

time frame, instructions, and diverse activities (see TV or read magazines), in the outline discussed here, one should ask what or which of these stimuli involved in the procedure effectively exert control over the reoccurrence of extinction.

Taking these aspects in consideration, one may raise the possibility that manipulations in the context and in the activities the subject engage in may be as important as the interval between the first and remaining presentations of the CS. Which one of these variables are responsible for the described effects? In addition to manipulating the interval, each procedure is varying many settings and with responses allowed to the participants, methodological variations that may themselves create different behavioral relations that influence the persistence of the extinction effect.

Regarding the activities the participants engage in during the interval, some of these may favor and others may hinder verbal behaviors that relate to the variables present in the conditioning phase. Verbal occurrence linked to contingencies can, by itself, establish new contingencies that could theoretically change the effects of this manipulation. This proposal is consistent with a recent study that found a relationship between verbal behavior and conditional responses: CR reoccurrence, measured by the startle response, was higher when subjects were asked to verbalize, at every presentation of the CS, whether they thought that the stimulus would be paired with the US in that particular attempt (Warren et al., 2014). Notably, these researchers evaluated the effects of verbal behavior during the presentations of the CSs but did not report what happened during the interval in the extinction phase, as suggested here. Nevertheless, the fact that they found effects of verbal behavior on CR reoccurrence raises the possibility—to be confirmed by future studies—that some participants may engage in covert verbal behaviors, such as “remembering” the experimental session, both the stimuli presented and their own responses or sensations. If this occurs during the manipulated interval, it could maintain (at a covert level) contingencies that are

being experimentally suppressed. Because these covert verbal behaviors are usually not under the experimenter's control, this could be a source of the difference between the studies. Searching for strategies to control, at least partially, these behaviors may be a way to investigate the relevance of this variable to the effectiveness of the extinction procedure.

Also worthy of consideration is the fact that in Schiller et al. (2010), during the conditioning phase, the CS+ was matched with the US in only 38% of attempts, while the CS- was not followed by the US in 100% of the presentations. Thus, this design manipulated a CS- with high predictive power (of non-shock) and a CS+ with low predictive power of an aversive event (approximately 1/3 chance of being followed by a shock). The literature indicates that the predictability of the stimuli may change the stimuli's aversiveness (Badia et al. 1973; Overmier, 1985; Seligman et al., 1971). For example, in human classical conditioning, evidence shows that the greater the degree of the unpredictability of an aversive stimulus, the higher the skin conductance response (Shankman et al. 2011). However, some studies have shown that 100% of CS-US pairings may cause a rapid decrease in CR during extinction (LaBar et al., 1998), while intermittent CS-US pairings have been shown to make CRs more resistant to extinction (Schiller et al., 2008). Among the studies analyzed compared here, we found that some used intermittent pairings (Oyárzun et al., 2012; Schiller et al., 2010; Schiller et al., 2013; Soter and Kindt, 2010) and others continuous pairings (Agren, Engman et al., 2012) between the CS+ and US. Therefore, this would be another variable that needs to be standardized to identify the variable responsible for the prevention of CR reoccurrence after extinction.

5. Summary and conclusions

Recent studies suggest that extinction may be long lasting when preceded by an isolated presentation of a stimulus that was present when conditioning

occurred. This stimulus can be the CS itself or the US and is effective in preventing reoccurrence of CR only when presented 10 min to 6 h before extinction. When combined in a meta-analysis, results from human studies show small-to-moderate effects for preventing CR reoccurrence relative to standard extinction procedures using the above procedures (see sections 3 and 4) (Kredlow et al., 2016). However, it is noteworthy that this procedure does not always produce the same results, with some studies reporting enduring extinction and others observing CR reoccurrence after extinction. We suggested that these conflicting results may be due to methodological variations among the studies that should be experimentally investigated, such as the pre-experimental characteristics of the participants, the nature of the CSs, the similarities and differences between the conditioning and extinction contexts and the activities engaged in during the intervals of the extinction procedure (especially those activities involving verbal behavior). Although the procedures described by Schiller et al. (2010) seem very promising for understanding basic learning processes, a lot of work is still needed to describe the variables that control the phenomenon. Also, if one is to use knowledge from these studies to improve treatments in applied situations (e.g., treatments for anxiety disorders), then it will be necessary to analyze thoroughly the behavioral manipulations that are needed in order to prevent CR reoccurrence. Although the effect is clear in some experimental studies, it is still not clear how this will be actually translated into applied situations.

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4 Behavioral analysis of non-experimental data associated with cultural practices

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Behavior analysis is seen usually as the experimental analysis of individual behavior, a distinctive contribution of the field to psychology in general. But what characterizes behavior analysis since Skinner days is the scientific method, not only experimentation, and not exclusively individual behavior. Behavior analysis as science may use field observation, for instance. Prediction and confirmation or disconfirmation do not require experimentation. The present work discusses some examples of behavior analyses of cultural practices in which the observation of interlocked behavior contingencies may happen without experimentation. This chapter is an authorized reprint of a 2009 article published in *Behavior and Social Issues*, 18, 10-14.

Behavior analysis is often referred to as *The Experimental Analysis of Behavior*, a method, an area, a philosophy, a technology (e.g., the ABA Method for treating autism). The prevalence of the part over the whole probably is due to an overemphasis on experiments. A behavior analyst is supposed to manipulate some independent variable, carefully observing its effect on some very closely observed measure of behavior.

The experimental analysis of individual behavior has been the trademark of behavior analysis, either in basic research or applied work. JABA, the Journal of Applied Behavior Analysis, could be called *Journal of the Experimental Analysis of Real Life Behavior*. However, behavior analysis is more than experimental analysis. Skinner (1953), writing on behavior analysis of human behavior was clear on that point. Paraphrasing Skinner, one could say that behavior analysis is first of all a set of attitudes. It is a disposition to deal with behavior rather than with what someone has said about behavior. Behavior analysis is a willingness to accept facts about behavior even when they are opposed to wishes. Behavior analysts have also discovered the

value of remaining without an answer until a satisfactory one can be found. Behavior analysis is a search for order, for uniformities, for lawful relations among environment and behavior (Skinner, 1953, pp. 12-13).

The material to be analyzed in a science of behavior comes from many sources: casual observations, controlled field observations, clinical observation, extensive observation under rigidly controlled conditions in institutional research, and laboratory studies of human behavior (Skinner, 1953, p. 37). The behavior of a single subject can be observed under many circumstances, even when other individuals are present. When the focus of interest is individual behavior, a social episode can be described using the same terms, concepts and principles involved in the interaction of a person with his physical environment. Groups do not behave, but the behavior of persons in groups has been of interest to behavior analysis. Groups do not behave, but the behavior of persons grouped together produce unique results.

When working with social issues, the focus on single subject can be expanded to the analysis of cultural practices involving groups of persons behaving in concert, where the behavior of a person has sense only when considered in the context of the result of the group. One way to study cultural practices is to analyze large sets of data that are gathered by private or public organizations. Another way to study cultural practices is the use of systematic observation of groups engaging in such practices.

Cultural practices often involve interlocked behavioral contingencies, where the behavior of a person may provide positive consequences for the behavior of a second person, discriminative stimuli for the behavior of a third person, and so on. In that case a cultural practice is structured through those interlocked behavioral contingencies (IBCs), which produce an aggregate product (a folk dance, for example), maintained by cultural consequences. Such practices usually are learned within the socialization process of the young and/or through the educational system. The relation between cultural consequences and a set of IBCs can be summarized as follows: If an IBC produces an aggregate product, then the social environment reacts with cultural consequences. Successive changes in the selection criterion may result in changes in the IBC set. When there is no planning involved in those criterion changes behavior

contingencies may survive within an IBC even without a function regarding the aggregate product.

Cultural consequences may be aversive, and in that case the aggregate product may be positive for a group of persons (*e.g*., bandits in a gang) and negative for others (society in general); the gang's IBCs will survive whenever aversive consequences are avoided. Sets of IBCs may compete for cultural consequences coming from the same selecting source, as in a competition of college bands.

Legal Control

Non-experimental studies of cultural practices being formed or transformed were conducted by Todorov, Moreira, Prudêncio & Pereira (2004), Machado & Todorov (2008), and Silva & Todorov (2008). Todorov et al. (2004) analyzed the text of the Brazilian law designed to protect children and adolescents and examined the official records of the judiciary system dealing with children and adolescents in Brasília, Brazil. As described by Todorov (2005), legal control involves a web of laws. A single unlawful act puts in motion an entire apparatus. For the Brazilian law, children and adolescents do not perform unlawful acts; at most, their behavior may be *in conflict with the law*. Thus the law introduces a new vocabulary, which should be accompanied by new cultural practices regarding children and adolescents.

The analysis of laws as metacontingencies, as sets of interlocked individual contingencies, helps in the study of how, when, and why laws do control behavior. Laws are made of three-term contingencies, interlocked in metacontingencies. Thus, one way of looking at how a law controls behavior is to begin with the analysis of the law as a written statement of interlocked contingencies that control individual behavior

The law is better written when it deals with undesirable behavior of adolescents and the desirable behavior of governmental agents when dealing with that undesirable behavior. With other issues, however, the law is not clear. An incomplete contingency opens the possibility of different interpretations, and sometimes to inaction. Article 4 of the law insures that it is the duty of the family, of the local community, of society in

general and of the State to assure the rights of children to food and health, without specification of consequences. As a way to control behavior, it is as good as nothing. In a judiciary system that is already slow, decision making by judges and attorneys sometimes follow the line of least effort. Police brutality, even with children, is seen in some parts of the country as a necessary educational measure (Todorov et al., 2004; Todorov, 2005).

In other cases the protection measures determined by the law are costly in terms of resources and manpower, so nothing happens. Thus, for a technological metacontingency to produce new cultural practices, other agencies besides the judiciary must act, like the educational system and nowadays the media, specially television, with society as a whole acting as external control of governmental agencies.

Prediction and Confirmation

The analysis of cultural phenomena and associated cultural practices may use any method which may lead to prediction and confirmation or disconfirmation. Silva & Todorov (2008) examined the records from 1998 to 2006 of a labor cooperative in Goiânia, State of Goiás, Brazil, interviewed members of the cooperative, and observed their operation in the present. Being a reunion of poor workers with a very low socioeconomic and educational level, the cooperative began mostly controlled by the rules of the Brazilian law regarding labor cooperatives, with the help of university students and teachers. The cooperative worked with recyclable material from garbage dumps, producing plastic pellets to sell to factories, and tiles made of paper, made waterproof through a chemical treatment. A cooperative is run by its general assembly – by law. Silva & Todorov (2008) found that at the beginning, in 1998, assembly meetings were frequent and the number of issues discussed were large, as expected from rule-governed behavior controlled by the text of the law. As the work advanced the number of meetings decreased, the assembly delegated power to councils, and later to managers. Issues discussed were few and directly related to production and sales. The cooperative was being run mostly like a small business, under the control of market

rather than rules; it had been transformed in business like any other by direct exposition to contingencies.

Natural Experiments

Major changes in cultural practices are happening everyday in some part of the world. In some cases a government, an organization, a church, or other institutions, plan carefully steps to achieve a change in behavior of the people. Sometimes the planning and implementation of a major change is well documented, so behavior analysts can reconstitute behavior processes and describe events in behavior analytic terms. That kind of reconstitution was made by Machado & Todorov (2008) regarding the behavior of pedestrians and drivers in Brasília, Brazil. Up to 1996 the crosswalk sign on streets was utterly ignored by drivers and pedestrians everywhere in Brazil. Since 1996 it is safe to use the crosswalks in Brasília, but only in Brasília; the rest of the country did not change. Cultural practices of drivers and pedestrians changed after a concerted effort involving government, the media, nongovernmental organizations, churches, schools, and civil associations in general. The campaign involved publicity of ***rules***: the law supposed to control the use of crosswalks. It also involved ***modeling***: both professional and amateur artists showed how to use the crosswalk, both *in vivo* and in schools. Finally, after three months of rules and modeling, pedestrians and drivers were exposed to the ***contingencies***: fines for those misbehaving, with the media showing to everyone else who was being fined.

The well concatenated actions of so many institutions were possible through the intervening role of the University of Brasília. A short term metacontingency was established during meetings of a forum, where representatives of all institutions voluntarily engaged in the campaign discussed and voted on actions that should be taken, and on the timing of those actions. Twelve years later the change in behavior of drivers and pedestrians in Brasília is maintained. The short term metacontingency was sufficient to establish the control of the behavior of drivers by pedestrians approaching a crosswalk, and of pedestrians by cars approaching a crosswalk. The concept of metacontingency is not necessary to explain the interplay between drivers and pedestrians near a crosswalk,

but it certainly was useful in understanding how this major change in cultural practices was accomplished and maintained in Brasília. The work of Machado & Todorov (2008) offers the opportunity for a manual for the education of drivers and pedestrians in any city, written in behavior analytic terms describing the behavioral processes involved.

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5 Theory of control by justifications and immediate consequences[1]

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Abstract

This chapter presents the Theory of Control by Justifications and Immediate Consequences (TJC). This theory, based on experimental results, is composed of some concepts formulated in previous studies. The Theory postulates the establishment of boundaries between what should be attributed to functions from stimuli constituent of rules and what should be attributed to functions from stimuli constituent of reinforcement contingencies. The establishment of such boundaries is important because it can contribute to clarify the effects of justifications, as stimuli constituent of rules, and immediate consequences, as stimuli constituting contingencies of reinforcement, in determining stimuli functions and behavior topographies. And to clarify the role of these variables in explaining why organisms behave the way they do. Considering this, the present chapter has as purpose present the constitutive concepts of the TJC.

Keywords: Rule-governed behavior, behavior shaped by reinforcement contingencies, justifications, immediate consequences, behavior explanation.

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Studies in the area that investigate the functions of rules following the tradition of studies in behavior analysis have contributed to identify the defining properties of behavior and its control variables. Consistent with such traditions this study introduces the Theory of Control by Justifications and Immediate Consequences (Albuquerque & Paracampo, in press, 2018). This theory (TJC) is constituted from the following concepts formulated in previous studies: formal properties of verbal stimuli; behavior; social environment; verbal and nonverbal social environment; rules; immediate consequences; Types 1, 2, 3, 4 and 5 justifications; control history by immediate consequences; control history by justification; control history through the interaction between justifications and differential immediate consequences, to rule following and non-following; rules with and without reported justifications; future events susceptible and future events not susceptible to be contacted; control by rules; control by reinforcement contingencies; rule controlled behavior; reinforcement contingencies controlled behavior; approval or disapproval by justifications and approval or disapproval by immediate consequences.

Formal properties of verbal stimuli

Behavior analysis is distinguished from other Psychology approaches mainly because it is characterized by performing a functional analysis of behavior. In such analysis, behavior is mainly defined by its control variables. Behavior control variables are mainly defined by their effects on the behavior. However, the formal properties of behavior control variables should also be considered in the definition of their effects especially when such variables are verbal. In other words, when the behavior control variables are verbal stimuli, the functions from such stimuli depends in part on their formal properties (Albuquerque & Paracampo, 2010; Albuquerque, Paracampo, Matsuo, & Mescouto, 2013; Albuquerque & Paracampo, in press, 2018).

Formal properties of verbal stimuli are the characteristics presented by the verbal stimulus that determine in part what it looks like to a verbal community according to its practices. For instance, the stimuli: "You have to do it?", "You must do it" and "You should do it", present some characteristics that allow a certain community to say

that the first stimulus has the form of a question, the second has the form of an order and the third is in the form of a suggestion. Thus the formal properties of verbal stimuli are environmental variables susceptible to be manipulated and their effects on behavior can be observed. So it is possible in a behavioral analysis to make a functional analysis of the formal properties of verbal stimuli effects on behavior and to identify how such formal properties work and how they contribute in defining behavior control variables (Albuquerque & Paracampo, 2010; Albuquerque et al., 2013; Albuquerque & Paracampo, in press, 2018).

Definition of rules

Rules have three defining properties. The first one is the formal property of rules that may describe behavior and its control variables. It is this formal property that allows rules to exert their functions. The second is the functional property of rules that can determine the topography of behavior and change its probability of occurring and being maintained regardless of the immediate consequences produced by it and regardless of the space-time contiguity between rule and behavior. And the third is the functional property of rules that may alter the function of antecedent and consequent stimuli regardless of the immediate consequences[2] produced by the behavior and regardless of space-time contiguity between rule and stimulus (Albuquerque et al., 2013).

By this proposition, rules are verbal antecedent stimuli that can describe behavior and its control variables; establish the behavior topography; change the probability of this behavior occurring and be maintained; and alter the stimuli functions regardless of the immediate consequences produced by behavior and space-time contiguity between stimulus-behavior and stimulus-stimulus (Albuquerque et al., 2013; Albuquerque & Paracampo, in press, 2018). *Behavior* is the organism action as a result of its control variables.

2. Immediate consequences are events produced immediately by the behavior after its emission. In a fixed ratio reinforcement schedule, for instance, the immediate consequences are the presentation of the programmed reinforcement immediately after a response (reinforcement) and not the presentation of the programmed reinforcement immediately after other responses (extinction) (Paracampo, Albuquerque, Mescouto, & Farias, 2013).

The organism action as a behavior control variable and the product of such action shape the organism *social environment*. The *verbal social environment* may work as rules and as contingencies of reinforcement. Though the *nonverbal social environment* may work as reinforcement contingencies, but it does not function as rules. Thus the social environment of humans is verbal and the social environment of other animals is nonverbal.

Therefore it is the defining property of the verbal environment that allows humans unlike other animals to learn and teach what they know through rules independently of both the immediate consequences produced by behavior and the space-time contiguity between stimulus-behavior and stimulus-stimulus; and in this way, increase their repertoires of behaviors (Albuquerque & Paracampo, in press). According to this proposition, what is behavior in a social relation may become behavior control social variable in another and vice versa. The combination of such relations can be called a social relation. Thus in a social relation the organism action as a result of its control variables (such as command, touch, autoclitic, rule following, etc.) is considered dependent variable. Although the organism action as a behavior control variable (such as the stimuli constituent of verbal contingencies and the stimuli constituent of rules) is considered an independent variable. In this way, the organism action as a behavior control variable should not be called behavior, but rather a stimulus (Albuquerque & Paracampo, in press, 2018).

The definition of the term *rules* proposed by Albuquerque et al. (2013) has several advantages. (1) This definition identifies the rule defining properties. (2) It combines the major definitions of rules in the psychology area, that is, it agrees with definitions that suggest that rules are discriminative stimuli specifying contingencies (Skinner, 1969); stimuli altering function of other stimuli (Schlinger & Blakely, 1987); establishing operations and discriminative stimuli (Malott, 1989); and, verbal antecedent stimuli (Zettle & Hayes, 1982). But the Albuquerque et al. (2013) definition of rules, in addition to Skinner's definition, indicates that rules may alter the stimuli functions; in addition to the definition of Schlinger and Blakely, it indicates that rules may evoke behavior; in addition to Malott's definition, it indicates that rules, other than discriminative stimuli and establishing operations, can determine the topography of new

behaviors; in addition to the definition of Zettle and Hayes, it indicates that the effects of rules depend in part on their formal properties, and unlike all previous definitions it emphasizes that rules can exert their functions independently of the immediate consequences produced by behavior and space-time contiguity between stimulus-behavior and stimulus-stimulus. (3) Furthermore, the Albuquerque et al. (2013) definition of rules indicates distinction between verbal and nonverbal environment and the definition between the social environment of humans and other animals. And (4) this definition is supported by experimental evidence (Albuquerque, de Souza, Matos, & Paracampo, 2003; Albuquerque & Ferreira, 2001; Albuquerque, Mescouto, & Paracampo, 2011; Matsuo, Albuquerque, & Paracampo, 2014; Paracampo et al., 2013; Albuquerque & Paracampo, in press, 2018)

Selection of behavior by immediate consequences and selection of behavior by justifications

According to the Theory of Control by Justifications and Immediate Consequences (TJC), the proposition that rules may alter the probability in which the behavior specified by it will occur and be maintained, which is, that rules can select behavior (Albuquerque, 2005; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018) should be clarified, once it differs in part from Skinner's view (1969, 1974, 1981, 1989) of why people behave the way they do.

According to Skinner (1974), all behavior including rule-governed behavior is determined by consequences. By this proposition, a rule may evoke the behavior described by it, but once it occurs, the evoked behavior would be maintained (that is, selected) by its consequences. So a rule ("Fasten your seatbelt", for example) may evoke the behavior described by it, but it would not change the probability of rule following to occur in the future, that is, a rule would not maintain the behavior evoked by it. It would be the consequences that would change the probability of this behavior occurring and be maintained. In other words, what would select whether a listener would continue following the "Fasten your seatbelt" rule or not, for example, would not be the rule but the history of exposure to consequences for rule following (Skinner,

1969). In general, scholars agree with this proposition (Baumann, Abreu-Rodrigues, & Souza, 2009; Baum, 1994, 1999; Baron & Galizio,1983; Catania, Shimoff, & Matthews, 1989; Cerutti, 1989; Chase & Danforth, 1991; Hayes, Brownstein, Zettle, Rosenfarb, & Korn, 1986; Martinez & Tomayo, 2005; Newman, Buffington, & Hemmes, 1995; Okoughi, 1999; Perez, Reis, & de Souza, 2009; Torgrud & Holborn, 1990; Wulfert et al., 1994).

However, it is unclear in Skinner's proposition (1969) whether the consequences that would alter the probability of rule following to occur in the future would be the immediate consequences of rule following and non-following or future consequences[3] reported in rules for the occurrence and maintenance of such behaviors.

According to the TJC, the distinction between the stimuli constituent of rules (future consequences reports, for example) effects and the stimuli constituent of reinforcement contingencies (behavior's immediate consequences, for example) effects on behavior is relevant because such a distinction implicates in establishing the boundaries between what is control by stimuli constituent of rules and what is control by stimuli constituent of reinforcement contingencies (Albuquerque et al., 2014).

The reported future consequences in rules are verbal stimuli antecedents constituent of rule and can exert control over the behavior when the listener comes into contact with the rule, that is, when the rule is heard and/or read by the listener in the moment it is presented. The reported future event itself does not exert control over the behavior because this event is not produced by the behavior in the moment the rule is presented.

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3. Future consequences are events that are not immediately produced by the behavior after its emission and may or may not occur in a long term. For instance, a behavior (walking around Republic Square on Saturday mornings) and a future consequence (finding the person you are looking for) can be part of a reinforcement contingency. But when a speaker describes this relation to a listener (when the speaker says: "Walk in the Republic Square on Saturday mornings and you'll find the person you are looking for") and the behavior specified by that rule occurs prior the occurrence of the reported event, such behavior should be considered as controlled by the stimuli constituent of rule. When the behavior specified by the rule produces the reported event it starts to be controlled by the interaction between the stimuli constituent of rule (the report saying that you will find the person you are looking for) and the immediate consequence produced (the contact with such person) (Paracampo et al., 2013).

When the reported event starts to be produced by behavior, it is not produced as a future event, but rather as a behavior immediate consequence and it is how it may exert control. Thus the rule would function as a nowadays substitute for historical events and future events reported by it (Albuquerque et al., 2011; Albuquerque et al., 2014; Paracampo et al., 2013).

Still according to the TJC, a rule generally indicates the behavior to be established. But, in addition, some rules may also provide *justifications*, both for the behavior specified by the rule to be evoked and maintained (or not), and for altering the stimuli functions related to the specified behavior (Albuquerque & Paracampo, in press, 2018). Albuquerque et al. (2013) and Albuquerque et al. (2014) have suggested the use of the term *justifications* to describe the stimuli constituent of rule effects that may interfere with the behavior specified by the rule. So, the term *justifications* distinguishes the stimuli effects that constitute the rule (future consequences reports, for example) from the stimuli effects that constitute the reinforcement contingency (behavior's immediate consequences, for example) in determining the stimuli functions, the topography of behavior and its probability of occurring in the future (Albuquerque et al., 2011; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018; Matsuo et al., 2014; Paracampo et al., 2013).

So *justifications* are stimuli constituent of rule that can alter the function of stimuli, determine the topography of the behavior and its probability of occurring and being maintained (Albuquerque et al., 2013). For instance, let's suppose a speaker invites a listener to a party and the listener refuses the invitation. But the speaker gives the justification that "John Doe" is going to be at the party and the listener then says she's going to the party. In this example, justification would alter the party's function and the probability of the listener going to the party (Albuquerque, et al., 2014; Paracampo et al., 2013). TJC postulates thereby that behavior can be selected not only for its immediate consequences but also can be selected by justifications constituent of rules (Albuquerque & Paracampo, in press, 2018). According to Albuquerque et al. (2013), the main *types of justifications* constituent of rules are verbal antecedent reports regarding:

(1) *Possible consequences of rule following or non-following*; in reports that may indicate whether the consequences are aversive or reinforcing; of great or little magnitude; likely to be contacted or not. For instance, a speaker may present the following rule: "Go study" and add the following Type 1 justifications: "So you can get a scholarship"; "If you don't study, you will fail", etc. A speaker may also present the rule: "Don't go to Y, go to X" and add the following Type 1 justification: "Because only in X you will find what you are looking for."

(2) *Possible approval or disapproval of the rule following or non-following*; observed in reports that may indicate whether the speaker or other people approve or not, care or not that the rule is followed. For instance, a speaker may present the rule: "Go study" and add the following Type 2 justifications: "Don't disappoint me"; "Only this way can you give a better future for our family". A speaker may also state the rule: "Don't study X, study Y" and add the following Type 2 justification: "If you choose to study Y, your father will be very proud of you."

(3) *Confidence in the speaker*; expressed in reports such as "I think", "I'm not sure", "I'm safe", "Trust me, I have one of these and it never was a problem", etc., which may indicate whether the reported consequences will actually be produced or not by the rule following or non-following. For instance, a speaker may present the rule: "Go study" and add the following Type 3 justification: "This subject usually is on the exam, trust me". The speaker may also state the rule: "Could you lend me five thousand dollars?" and add the following Type 3 justification: "I promise I will pay you, trust me".

(4) *The rule form*; located in reports that may indicate whether the rule has the form of promise, threat, order, advice, agreement, doubt, request, question, opinion, speech, lesson, lecture, poem, novel, tale, talk, letter, newspaper report, film, soap opera, documentary, advertisement, manual, recipe, etc. For instance, a speaker may present the rule: "Don't go" and add the following Type 4 justifications: "I beg you", "I beseech you", "This is an order", "This is my suggestion", "This is my opinion", "This is my advice", etc. Thus Type 4 justifications (reports on the rule form) are the different ways in which a certain

justification can be presented to the listener in order to change the stimuli functions and the probability of behavior to occur and be maintained.

(5) *What to observe*: reports that may indicate examples of behaviors to be followed or not. For instance, a speaker may present the rule: "Go study" and add the following Type 5 justification: "'John Doe' studied and won the contest". The speaker may also present the rule: "Eat the whole salad" and add the following Type 5 justification: "Look, your brother ate it all".

Generally, the verbal environment that may affect the listener's behavior is largely constituted by rules and justifications to rule following and non-following available in the media, books, classes, lectures, documents, laws, manuals, posters, conversations, etc. So, the listener is not exposed to justifications only when is in contact with the voice or with the text of a specific speaker. It should be also highlighted that often a specific justification, mainly Type 4, is presented not alone but combined with other justifications (Albuquerque & Paracampo, in press, 2018).

The Albuquerque et al. (2011) study signalizes more clearly how differential justifications can exert their functions. In such study, the Type 2 justifications effects were evaluated. It indicated that the speaker approved (case of the rule in an order form) or did not clearly approve (case of the rule in suggestion form) rule following; and Type 4 justifications (indicated that one rule had the form of suggestion and the other had the form of order) on the rule following. To do so, they exposed 24 college students to a choice procedure according to the sample, adapted from the one developed by Albuquerque (1991). Each comparison stimulus presented only one dimension - color (C), thickness (T) or shape (S) - in common with the sample stimulus and differed in the others. The task was to point to the comparison stimuli in sequence. The rule was named discrepant when the immediate consequence produced by the behavior specified by it did not correspond to the Type 1 justification (reports on possible rule following and non-following consequences) constituent of rule. That is, in this case, when rule following did not produce a point. Considering that the Type 1 justification for all groups was: "By doing so, you can earn points that will be displayed on the counter

in front of you. Each point you win will be exchanged for $ 0.05 (five cents) only at the end of the research".

Students were divided in four groups. Each group, with six participants, was exposed to three phases. In Phase 1, participant would produce the programmed reinforcement (point) only if he chose the CTS sequence, that is, if he chose first, the comparison stimulus of the same color from the sample; second, the comparison stimulus of the same thickness from the sample; and, third, the comparison stimulus of the same shape from the sample. Phase 1 consisted of three steps: establishment, extinction and recovery of the correct sequence (CTS) response. It the beginning of this phase the CTS sequence was differentially reinforced in a continuous reinforcement schedule (CRF). Immediately after the participant received ten consecutive points in CRF, a gradual increase in the value of fixed ratio schedule to FR 4 was made. In this fixed ratio schedule, every four consecutive emissions of the correct sequence would produce one point on the counter. The non-consecutive emission of the correct sequence restarted the fixed ratio - 4 (FR 4) to obtain a point. The shaping procedure could vary depending on the each participant's performance, but generally in the beginning of such procedure the CTS sequence was reinforced in FR 2. After the participant would have scored four points in FR 2, the CTS sequence would be reinforced in FR 3. After four more points were obtained in FR 3, it was reinforced in FR 4 until four points were obtained in FR 4, when the correct sequence stopped being reinforced during 80 attempts (extinction). After the extinction procedure, the correct sequence shaping procedure was restarted, that is, the CTS sequence was once again reinforced in CRF and then a gradual increase in the value of the fixed ratio schedule to FR 4 was made. This phase was terminated after the four consecutive points granting in FR 4 (being 16 sequences, four reinforced) since the participant had already obtained at least 16 points in FR 4 in the recovery step. This phase could be also terminated if the participant went through 160 attempts (two sessions) without earning points in the establishment step or in the recovery step of the correct sequence. Thus only participants who reached the performance criterion for the termination of Phase 1 were exposed to Phase 2. The shaping procedure only occurred in Phase 1. In Phases 2 and 3, the programmed reinforcement contingencies were kept unchanged (that is, the CTS

sequence emission continued to be reinforced in FR 4) while the justifications were manipulated to follow the discrepant rules. So, in Phase 1, it was demonstrated control on the programmed reinforcement contingencies, that is, it was established by reinforcement contingencies an alternative behavior (the CTS sequence) to the one specified by the discrepant rules, before the presentation of such rules in Phases 2 and 3. In Phase 1 of Groups 1 and 3, questions were asked about the programmed contingencies. To Groups 2 and 4, no questions were asked. To Groups 1 and 2, Phase 2 was started with a discrepant rule in suggestion form, and Phase 3 with a discrepant rule in the order form. To Groups 3 and 4, it was the contrary. The suggestion specified: "When I show you these objects, do what you think is best for you. If you want, you can do the following:…". Then, specified that the SCT sequence would produce a point. Although the order specified: "When I show you these objects, I want you to do the following:…". Then, specified that the TCS sequence would produce a point. In both cases discrepant rule following produced no point and the correct sequence (CTS) produced point.

Two out of the 24 students (one in Group 3 and one in Group 4) did not learn the correct sequence in Phase 1 and were not exposed to Phases 2 and 3. In Group 1, five out of the six participants did not follow the suggestion in Phase 2. In a contrast, in Group 4, all five participants followed the order in Phase 2. In Groups 2 and 3 there was variability in the results, that is, in Group 2, 3 participants followed and three stopped following the suggestion in Phase 2. In Group 3, three out of the five participants followed the order in Phase 2.

Phase 2 results from Groups 1 and 4 indicate that the behavior specified by the discrepant rule was more likely to be established and maintained when the Type 2 justification indicated that the researcher approved rule following ("When I show you these objects, I want you to do the following:...") than when the Type 2 justification indicated that the researcher did not care that the rule was followed ("When I show you these objects, do what you think is best for you. If you want, you can do the following: ...") (Albuquerque et al., 2011; Gonçalves, Albuquerque, & Paracampo, 2015). In other words, Phase 2 results from Groups 1 and 4 combined, signalize that the behavior specified by the discrepant rule is more likely to be selected by Type 2 justification,

when this justification indicates that the researcher cares that the rule is followed ("*When I show you these objects, I want you to do the following*: ...") than when that justification indicates that the researcher does not care that the rule is followed ("*When I show you these objects, do what you think is best for you. If you want, you can do the following*: ... ") (Albuquerque & Paracampo, in press, 2018).

According to TJC, justifications (as stimuli constituent of a rule) may exert functions very similar to those exerted by the behavior's immediate consequences (as stimuli constituent of a reinforcement contingency), that is, justifications can: (a) change the stimuli function; (b) determine the behavior's topography; and, (c) change the probability of the behavior occurring and being maintained. The difference is that justifications are antecedent stimuli that can exert these functions as nowadays substitutes for historical and future events. Therefore as immediate consequences of behavior, justifications can also select the wide repertoires of human behaviors (Albuquerque et al., 2011; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

Matsuo et al. (2014) study presents additional empirical evidence of how justifications can select behavior. In such study, the effects of justifications on the behavior's choice to emit a complex sequence (with six responses) or a simple sequence (with three responses) were investigated. So six university students were exposed to a choice procedure according to the sample, adapted from the one developed by Albuquerque (1991). The task was choosing to point to each of the three comparison stimuli or in the TSC sequence (simple sequence) or in the TSCSCT sequence (complex sequence).

The minimum instruction did not specify sequence. The rule without further justification contained Type 1 justification (reports on possible consequences of rule following or non-following) indicating the same earning points' promise for both simple and complex sequence choice. The rule with additional Type 1 justification specified that if the participant would choose the complex sequence, he would earn twice as many points as if he would choose the simple sequence. The rule with additional Type 2 justification (reports on possible approval or disapproval of rule following or non following) specified that if the participant would choose the complex sequence, the

other participants in that research would also earn points, so he would be helping others. The emission of any sequence, simple or complex, did not produce a point. Phase 1, baseline, was initiated with the presentation of the minimum instruction and terminated after the occurrence of ten attempts. Each of the other phases was initiated with the presentation of a rule and terminated after the occurrence of 20 attempts. Phase 2 was initiated with the rule without additional justifications and each of Phases 3 and 4 was initiated with the presentation of a rule with additional justification. The six participants were divided in two conditions differing only on the rules with additional justifications were presented to all participants in Phases 3 and 4 order.

In Phase 1, performance was variable. In phases without additional justifications, the simple sequence was presented. And in phases with additional justifications, the complex sequence was presented. Such results demonstrate that justifications can alter stimuli function as well as determine behavior's topography, as topographical characteristics of behavior have changed from different sequences in Phase 1 to the TSC (single) sequence in Phase 2 and the TSC sequence in the Phase 2 for the TSCSCT (complex) sequence in Phases 3 and 4, due to the differences between the justifications for rule following. The results also support the proposition that justifications can select behavior, that is, they can change the probability of the behavior specified by the rule occurring and being maintained (Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

Outside the laboratory, in people's daily lives, it can also be found evidence that justifications can select behavior. For instance, the cultural practice of using condoms in sexual relationships has been selected and is largely maintained by justifications of: Type 1 (reports on possible consequences of rule following or non-following), such as reports recommending the use of condoms to avoid sexually transmitted diseases; Type 2 (reports on possible approval or disapproval of rule following or non-following), such as reports from authorities, famous people, scientists recommending the use of condoms; Type 3 (reports on confidence in the speaker), such as reports indicating that without condom there is no safe sex, even in long relationships; Type 4 (reports on the rule form), such as the presentation of these justifications in manual, propaganda, speech, orientation, etc. form; and Type 5 (reports on what to watch: reports that may

indicate examples of behaviors to be followed and of behaviors not to be followed), such as reports of people who did not follow the rule and contracted a severe disease (Albuquerque & Paracampo, in press, 2018).

Listener's Histories

According to TJC, justifications may report *future events susceptible and future events not susceptible to be contacted* (produced) by the rule following and non-following behavior. An example of the first case would be a Type 2 justification (reports on possible approval or disapproval of rule following or non-following) indicating that if the listener donates anything he will have the beneficiaries' gratitude. An example of the second case would be a Type 5 justification (reports on what to observe) indicating that people who make donations are people who are admirable and have the God's blessing and therefore if the listener donates as well he will also be included among the admirable people and will have the God's blessing.

In both cases, the justifications, as verbal antecedent's stimuli constituent of rules, exert control at the moment the rule is presented. However, the future event reported in the justification (having the beneficiaries' gratitude in the first case and having the God's blessing in the second case) does not exert control for this event isn't produced by the behavior specified by the rule when it is presented. In the first case, when the reported event starts to be produced by the previously specified rule behavior, it isn't produced as a future event, but rather as a behavior's immediate consequence and in that way it can exert control. So, in the first case, when rule following produces the reported event (the donator listener is praised by the benefited person, for example) this behavior starts to be controlled by the interaction between the justification constituent of the rule and the immediate consequence produced. In the second case, though, as the reported event (God's blessing) cannot be produced by rule following, this behavior would be under control of justification (Albuquerque et al., 2013; Albuquerque, et al., 2014; Albuquerque & Paracampo, in press, 2018; Paracampo et al., 2013b; Matsuo et al., 2014).

The rules may be with justifications and without justifications. When the rule is without justifications (the rule: "Wait", for example), the behavior specified by it is not affected by the reported justification in the rule. When the rule has justifications (the rule: "Wait, we'll buy Y next year, because now we have to save money so we'll be able to buy X", for example) the behavior specified by it can be affected by the justification reported in the rule. In this way, different from when the rules are without justifications, when rules are with justifications, such justifications can select the behavior, that is, they can establish and maintain the behavior specified by the rule (Albuquerque & Paracampo, in press, 2018).

In all cases the behavior specified by the rule can be affected by the histories of the listener regardless of whether the particular rule is with or without justification and the future event reported in the justification is susceptible or not to be contacted. Therefore, beyond the justifications and nowadays immediate consequences, the occurrence and maintenance of the behavior specified by a rule can also be determined in part by the listener's histories, such as: 1) *history of control by differential immediate consequences*; 2) *history of control by differential justifications*; and, 3) *history control through the interaction between differential justifications and differential immediate consequences,* to rule following and non-following (Albuquerque & Paracampo, in press, 2018).

The difference between those three histories is that in the history of control by differential immediate consequences the behavior specified by rule is placed under control of the rule by its differential immediate consequences and not by justifications. Generally, throughout this history, the listener only follows a certain rule after rule following produces reinforcing immediate consequences (after the listener is praised for following the rule: "Brush your teeth", for example) and non-rule following to produce aversive immediate consequences (after the listener is reprimanded for not following the rule: "Brush your teeth," for example). In this case, the justifications would not exert control, because the rule is without justifications (Albuquerque & Paracampo, in press, 2018).

Although, in the history of control by differential justifications, the behavior specified by the rule is placed under control of rule by differential justifications and not

by immediate consequences (Albuquerque & Paracampo, in press, 2018). For instance, the speaker may present the rule with Type 5 justification (reports on what to watch): "Fasten your seatbelt. Look what happened to ‘John Doe’. He did not fasten his seatbelt and died. And ‘Jane Doe’, who did fasten her seatbelt, only had minor injuries". In this case, the listener would follow the rule without contacting the future events reported in justifications.

And in the history of control by the interaction between justifications and differential immediate consequences, rule following is maintained by the interaction between such variables (Albuquerque & Paracampo, in press, 2018). For instance, the speaker may present the rule with Type 1 justification (reports on possible consequences of rule following or non following): "Fasten your seatbelt, because now if you don’t it you’ll be charged" and, after contacting future events reported in justifications (after being fined for not fastening the seatbelt) the listener starts following this rule.

A special case from the general history of control by justifications is the *specific history of control by Type 5 justifications* (reports on what to observe). This particular history has the following characteristics: (a) allowing the listener to learn from others' histories reports, that is, the listener learns with justifications contained in the reports of other people's histories or characters from books, movies, novels, etc., and (b) contributing to the maintenance of both the behavior of rule following and the behavior of non-rule following, in proportion it may indicate why certain examples of rules should be followed and why other examples of rules should not to be followed by certain communities in certain situations (Albuquerque & Paracampo, in press, 2018).

For instance, in Aesop fable "The Boy Who Cried Wolf," the boy played a joke with his neighbors. He lied to his neighbors, shouting that there was a wolf near the sheeps. The boy was laughing when the neighbors noticed that there was no wolf. He once cried "wolf" when in fact there was a wolf near his sheep. But nobody went to help him. It may be assumed in this fable that the main character, the boy, would learn that one should not tell lies due to in part a history of control by the differential immediate consequences of lying and not lying behavior. Though the listener who has heard or read the fable would’ve learn that one should not tell lies due to in part the

specific history of control by Type 5 justification that would indicate to the listener that people tend not to believe in a person who has a history of telling lies, even when one speaks the truth. There is experimental evidence that Type 5 justifications contained in fables may alter the probability of rule following occurring and being maintained (Albuquerque & Paracampo, in press, 2018; Paracampo, Albuquerque, Carvalló, & Torres, 2009; Paracampo et al., 2013).

The specific history of control by Type 5 justifications (reports on what to observe) may also exert its functions combined with Type 4 justifications (reports on the rule form), that is, this history can exert its functions in other ways. People are frequently exposed to speeches, lessons, lectures, documentaries, advertisements, newspapers, magazines, the internet, etc. (Type 4 justifications) where Type 5 justifications are presented indicating both rules that must be followed and rules that must not be followed (Albuquerque & Paracampo, in press, 2018). For instance, some people are often exposed to Type 5 justifications which indicate that people who are questioning, innovative, are people admired by particular communities in certain situations. But those people also are often exposed to Type 5 justifications which indicate the advantages of rule following and the disadvantages of not following certain rules in situations where rule following is the most adaptive behavior, as in some public departments, etc.

So, this history would also contribute to maintain cultural practices. For instance, behaviors classified as vegan lifestyle are cultural practices maintained in part by Type 5 justifications which indicate that such practices are valued and are examples to be followed by members of the specific community formed by listeners performing such practice. Such a community would tend not to follow rules with justifications to eat food of animal origin, once such rules would be discrepant from the Type 5 justifications maintaining the cultural practice performed by the community, not to eat food of animal origin (Albuquerque et al. 2013; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018; Najjar, Albuquerque, Ferreira, & Paracampo, 2014).

Another special history, constituent of the general histories of control by immediate consequences, of control by justifications and control by the interaction between justifications and immediate consequences, is the *specific history of the*

alternative behavior to the one specified by the discrepant rule. This specific history has the following characteristics: (a) the alternative behavior to the one specified by the discrepant rule, that is, the behavior that replaces the behavior specified by the discrepant rule, is established before the listener is exposed to that rule; (b) such alternative behavior may be established and maintained by immediate consequences or justifications; and, (c) the history effects of this alternative behavior on the behavior specified by the discrepant rule depend in part on the relations between the combined favorable variables and not-favorable to the maintenance of such alternative behavior (before and after the listener is exposed to the discrepant rule) and the combined favorable variables and not-favorable to the maintenance of the behavior specified by the discrepant rule (Albuquerque et al., 2013; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

Behaviors controlled by rules, by reinforcement contingencies and by the interaction between rules and reinforcement contingencies

In the area investigating the rules functions, some scholars agree that behavior is under rule control when it is evoked by rule (Hayes, Brownstein, Haas, & Greenway, 1986; Shimoff, Matthews & Catania, 1986; Skinner, 1969). However, for TJC, it is not enough for a behavior to be evoked by rule so that it can be said it is controlled by rules. For a behavior to be considered as rule-controlled it is necessary to reject the possibility of it being under control of its immediate consequences. Similarly, for a behavior to be considered as reinforcement contingencies-controlled it is necessary to reject the possibility of it being under control of rules (Albuquerque, Reis, & Paracampo, 2006). So, behavior is rule governed when it is evoked by rule and maintained independently from its immediate consequences as observed, for example, in Phase 2 of Group 4 from the Albuquerque et al. (2011) study, when five participants followed the discrepant rule in the order form, although this behavior did not produce the programmed reinforcement. And behavior is reinforcement contingencies controlled when it is established by its immediate consequences and occurs independently of rule, [as observed, for example, in Phase 2 of Group 3 from the Albuquerque et al. (2011)

study, when two participants stopped following the discrepant rule in the order form and began to present the correct sequence under control of the programmed immediate consequences] (Albuquerque, 2001; Albuquerque et al., 2003; Albuquerque, Matos, de Souza, & Paracampo, 2004; Albuquerque, Reis, & Paracampo, 2008; Albuquerque et al., 2014).

The behavior specified by a rule may depend on its immediate consequences, but when it occurs this behavior is no longer purely governed by rules and starts to be controlled either by reinforcement contingencies [case of the two participants that stopped following the discrepant rule in Phase 2 of Group 3 from the Albuquerque et al. (2011) study, for example] or by the interaction between rule and such contingencies [case of the session data in which correspondent rules to the programmed reinforcement contingencies were followed in the (described below) Braga et al. (2010) study, for example]. The behavior is controlled by the interaction between rule and reinforcement contingency when it is maintained in part by the interaction between justifications constituent of rules and immediate consequences (Albuquerque et al., 2003; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

When behavior is governed by rules, it's the justifications that determine the behavior's topography; the probability of the behavior occurring and being maintained; and, alter the stimuli functions. Though, when behavior is controlled by reinforcement contingencies, it's the immediate consequences of behavior that exert such functions (Albuquerque & Paracampo, in press, 2018).

It should be highlighted thereby that a verbal stimulus which may function as an immediate consequence for a behavior that has occurred and at the same time as a justification for future behavior, depending in part on its formal properties. In other words, just as the justifications' effects depend in part on its formal properties, the effects of verbal immediate consequences also depend in part on its formal properties and such formal properties may function as justifications for subsequent behaviors constituted in the rule. For instance, a comment (verbal consequence presented immediately after a behavior) can act as a criticism (decreasing the probability of the criticized behavior occurring again) or as a praise (increasing the probability of the praised behavior occurring) depending in part on its formal properties. Such formal

properties may also function as rules (in the form of suggestion, order, advice, warning, threat, etc.) with justifications indicating approval or disapproval of occurrences from reported subsequent behaviors in the commentary (Albuquerque et al., 2011; Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

So, according to TJC, there are two main aspects for the speaker to indicate to the listener that he approves or disapproves the maintenance of the behavior specified by a rule: (a) *approval or disapproval by justifications*; and, (b) *approval or disapproval by immediate consequences*. In the *approval or disapproval by justifications*, the stimuli (such as criticism, praise, admiration, rejection, etc.) are antecedent stimuli, that is, they are presented prior the behavior's occurrence. For instance, after the rule: "Wait", it's added the Type 2 justification: "I'll be calmer if you wait". Although, in the *approval or disapproval by immediate consequences*, the stimuli (such as criticism, praise, admiration, rejection, etc.) are consequent stimuli, that is, they are presented immediately after the behavior's occurrence. For instance, after the listener has waited, the following immediate consequence is presented: "I liked that you've waited". The approval effects should be considered as effects from stimuli constituent of rules in the first case and as effects from stimuli constituent of verbal contingencies in the second case (Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

Some studies' results (Albuquerque et al., 2011; Braga et al., 2010) support the proposition that justifications may approve or disapprove the occurrence and maintenance of the listener's behavior (Albuquerque et al., 2014). For instance, in the Braga et al. (2010) study, it was investigated the effects of Type 2 justifications (reports on possible approval or disapproval of rule following or non-following) and 4 (reports on the rule form) on behavior. More specifically, the effects of verbal antecedent stimuli presented in the (affirmative) form of instruction and in the (interrogative) form of question on behavior were investigated when such stimuli have specified or not the behavior's topography which produced the programmed reinforcement. For that, they used a version of the procedure developed by Albuquerque (1991). The task was pointing to the three comparison stimuli, in sequence. The programmed reinforcement was points exchanged for money. The participant was exposed to five phases. In Phase 1 (baseline) no sequence was instructed or reinforced with points. Each one of the other

four phases consisted of two sessions of 80 attempts each. Within each one of Phases 2, 3, 4 and 5, the programmed contingencies in Session 1 were always changed, without signaling, in Session 2. In Phase 2, the color-thickness-shape (CTS) sequence was reinforced in Session 1 and TSC was reinforced in Session 2. In Phase 3, TCS and CST were reinforced in Sessions 1 and 2, respectively. In Phase 4, the reinforced sequences were TSC and CTS in Sessions 1 and 2, respectively. And throughout Phase 5, CST and SCT were reinforced in Sessions 1 and 2, respectively. The sequences were reinforced in fixed ratio schedule 6 (FR 6). In this schedule of ratio fixed every six consecutive emissions of the correct sequence produced a point in the counter. The non consecutive emission of the correct sequence restarted the fixed ratio - 6 to obtain a point.

In Session 1 of Phases 2, 3, 4 and 5, one of the following verbal antecedent stimuli was presented: 1) instruction corresponding to the programmed contingencies in Session 1 of the phase in which it was presented: "When I show you these objects, you must do the following: You must point first to the same color [shape or thickness], then to the same thickness [color or shape] and later to the same shape [thickness or color]". This correspondent instruction specified the CTS, TCS, TSC and CST sequences in Session 1 of Phases 2, 3, 4 and 5, respectively. 2) Question corresponding to the programmed contingencies in Session 1 of the phase in which it was presented: "When I show you these objects, what you must do? Should you point first to the same color [shape or thickness], then to the same thickness [color or shape] and later to the same shape [thickness or color]?". This correspondent question specified the CTS, TCS, TSC and CST sequences in Session 1 of Phases 2, 3, 4 and 5, respectively. 3) Minimal instruction: "When I show you these objects, you must do the following: You must point to each of the three comparison objects in sequence to earn points". And 4) minimal question: “When I show you these objects, what you must do? Should you point to each of the three comparison objects in sequence to earn points?”. Each participant was exposed to these four verbal antecedent stimuli. The order in which these stimuli were presented was manipulated amongst experimental conditions only to evaluate order effects.

Results showed that the correspondent instruction exerted the functions of rules when determined the behavior's topography in the first session of the phases in which it was presented and maintained this behavior independently from the programmed immediate consequences in the second session of these phases in 23 out of the 24 possible cases (corresponding to 95%). In a similar way, the question correspondent to the programmed contingencies also managed to exert these rules functions, but this occurred only in eight out of the 24 possible cases (corresponding to 33%). In a contrast, only two out of the 24 participants responded correctly, both in the sessions started with the minimum instruction and in those initiated with the minimum question.

Results showed that for a verbal antecedent stimulus to exert the function of rule with justifications, to determine the topography and to evoke a behavior it is necessary that it specifies the behavior to be evoked. However, specifying the behavior to be evoked is not a sufficient condition for a verbal antecedent stimulus to exert this rule function (Albuquerque & Ferreira, 2001). The data, showing that the instruction and the correspondent question functioned as a rule in 95 and 33% of the possible cases, respectively, support this suggestion.

Such differences in results may have occurred in part due to differences between Type 2 justifications (reports on possible approval or disapproval of rule following or non-following) presented for the behavior specified by the rule to be evoked and maintained in such study. Type 2 justification: "When I show you these objects, you should do the following:" contained in the correspondent statement, recommended that the listener should do what the rule specified that should be done and thus indicated that the speaker approved the choice of the specified sequence. Though the Type 2 justification: "When I show you these objects, what you should do?" contained in the correspondent question, put in doubt whether the listener should do what the rule specified and thus indicated that the speaker did not clearly approve the choice of the sequence specified. This analysis suggests that Type 2 justifications which indicate that the speaker approves the behavior specified by the rule are more likely to determine the occurrence and maintenance of the behavior specified by the rule than Type 2 justifications that question whether the behavior specified by the rule is what should be emitted (Albuquerque et al., 2014; Albuquerque & Paracampo, in press, 2018).

Thus, according to TJC, justifications constituent of rules can also select behavior insofar they can determine that it's the behavior specified by the rule, rather than another, that should continue to be emitted or not in the presence of the stimuli described by them, not others (Albuquerque & Paracampo, in press, 2018). However, the effects of justifications, mainly the effects of Type 1 justifications (reports on the possible consequences of rule following or non-following), Type 2 (reports on possible approval or disapproval of rule following or non-following) and Type 5 (reports on what to observe), have been considered as being effects of immediate consequences (that is, from reinforcement contingencies) or more specifically as if they were effects of: verbal contingencies (Skinner, 1969); socially mediated consequences (Hayes et al., 1986b); instructional consequences (Cerutti, 1989), cultural consequences (Matos, 2001); contingencies acting directly and indirectly (Malott, 1989); proximate and ultimate contingency (Baum, 1999); and, verbal and social contingencies of superior order (Catania, 1998). Thus the use of such terms as well as the classification of the rule following in *Pliance* and *Tracking* (Hayes et al., 1986b) don't contribute to the elucidation of distinction between what is control by stimuli constituent of rule and what is control by stimuli constituent of reinforcement contingencies and, in such manner, doesn't contribute to distinguish what is control by rule and what is control by such contingencies of reinforcement (Albuquerque et al., 2014).

Final reflections

The *Theory of Control by Justifications and Immediate Consequences* highlights not only the effects of rules on evoking behavior, but also emphasizes that "neutral", "discriminatory", "reinforcing", "punitive", "conditional", "contextual", "motivating", "private", etc. stimuli can have their functions altered due to justifications constituent of rules. Furthermore, it emphasizes that the topography and probability of behavior to occur and being maintained in the presence of stimuli can also be altered due to manipulations in justifications constituent of rules. Thus the TJC postulates that human behavior is not exclusively selected by its immediate consequences, once it can also be selected by justifications, as some experimental evidence proves (Albuquerque et al., 2011; Braga et al., 2010; Paracampo et al., 2013; Matsuo et al., 2014). It also postulates

that distinction between the effects of stimuli constituent of rules and the effects of other stimuli in determining behavior and stimuli functions is important for such a distinction implies establishing the boundaries between what should be attributed to stimuli constituent of rules functions and what should be attributed to stimuli constituent of reinforcement contingencies functions. And why, despite its relevance, such a distinction has been little considered in behavior analysis (Albuquerque et al., 2011, 2014; Albuquerque & Paracampo, in press, 2018; Paracampo et al., 2013; Matsuo et al., 2014).

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6 Control by stimuli constituent of rules and reinforcement contingencies[1]

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Abstract

This chapter aims to describe the main variables that may favor or prevent control by rule, control by reinforcement contingencies and control by the interaction between rules and contingencies, in a given specific situation. The following variables' effects were analyzed: 1) types of justifications from rule following and non-following; (2) types of immediate consequences from rule following and non-following; (3) types of programmed schedules to reinforce the behavior specified by rule and the alternative behavior to that one specified by rule; and, (4) the histories of the listener. It is emphasized the suggestion that the behavior of following rules depends more on the combination between the set of favorable conditions and the set of conditions not favorable to their maintenance than of one or another condition, in isolation. And it is suggested that the term independence should be replaced by the term insensitivity in the description of control by stimuli constituent of rules and contingencies.

Keywords: Rules and contingencies, pre-experimental history, instructional control, insensitivity to contingencies, justifications.

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First studies in the area that investigates the rules functions[2]

The effects of rules[3], compared with the effects of reinforcement contingencies, began to be experimentally investigated in the 1960s; at the same time as Skinner (1963, 1966, 1969) began to present his theoretical propositions about the distinction between rule-governed behavior and contingency-shaped behavior. During this period, some studies have been published showing that control by rule could not only facilitate the development of control by programmed reinforcement contingencies on behavior (Ayllon & Azrin, 1964; Baron, Kaufman, & Stauber, 1969), but also could even surmount control over these contingencies (Kaufman, Baron, & Koop, 1966; Leander, Lippman, & Meyer, 1968; Lippman & Meyer, 1967).

Besides, some of these studies results also indicated that human behavior (adults and children up from five years of age), in a reinforcement schedule, tended to differ from other species behavior, both in response patterns and in its dependence to the schedule parameters (Baron et al., 1969; Kaufman et al., 1966; Leander et al., 1968; Lippman & Meyer, 1967). Results from these and other studies, performed in the 1960s, plus Skinner's propositions (1963, 1966, 1969), led some authors, from the late 1970s and early 1980s, to also investigate control by rules. During this period the main concern was to try to explain the differences between human and other animal behavior in reinforcement schedules, emphasizing the effects of rules and self-rules (rules introduced by persons to themselves) about human behavior (see Bentall & Lowe, 1987; Lowe, 1979).

But there was also as many a preoccupation with trying to find experimental evidence to show that behavior established by rules could be explained by the principles developed in the Experimental Analysis of Behavior and thus it was not necessary to develop new principles to explain this behavior (see Galizio, 1979; Baron &

2. This section is an updated version of excerpts from the Paracampo & Albuquerque (2005) chapter.
3. Rules are verbal antecedent stimuli that can describe the behavior and its control variables; establish the topography of behavior; alter the probability in which this behavior may occur and may be maintained; and, altering stimuli functions, regardless of the immediate consequences produced by behavior and space-time contiguity between stimulus-behavior and stimulus-stimulus (Albuquerque, Paracampo, Matsuo, & Mescouto, 2013).

Galizio, 1983; Cerutti, 1989); as a concern to develop alternative theoretical models to explain rule control, such as Hayes and Hayes' (1989) Relational Framework Theory.

Aside from trying to explain the control by rules, there were also attempts to explain the possible effects of self-rule. So much that procedures were developed in order to experimentally evaluate the effects of verbalizations (antecedent verbal stimuli) formulated by the listener in the course of his exposure to the scheduled contingencies, on his subsequent nonverbal behavior (see Catania, Matthews, & Shimoff, 1982). In this context, there were also some conceptual and practical concerns. Examples of such concerns include Zettle and Hayes' (1982) review concept of rule-controlled behavior, and their suggestions about the importance of this concept for cognitive-behavioral therapies. After this period, most of the studies, in this research line, began to systematically investigate the variables responsible for maintaining rule-following in order to clarify why rules are followed, whether these rules are presented by the speaker to the listener, or are derivative by the listener himself. In other words, most studies have begun to investigate the conditions under which behavior specified by rule is more or less likely to be maintained (Albuquerque & Ferreira, 2001).

Therefore, focus of attention shifted from the investigation of effects of rules with the purpose of explaining the differences between behavior of humans and of other animals in reinforcement schedules for the investigation of variables responsible for occurrence and maintenance from behavior of following rules with the purpose of clarifying the role of rule-based control in determination and explanation of human behavior (see Baron & Galizio, 1983; Hayes, Zettle, & Rosenfarb, 1989, for a more detailed review of the first studies conducted in this line of research).

Understanding of rules

For the behavior specified by a rule to occur, the rule must be understood first. To understand a rule is the behavior under control of the relations between the stimuli constituent of rule and the stimuli reported by the stimuli constituent of rule,

according to the cultural practices of a particular verbal community. For example, the rule: "Take the * so you can earn a thousand *reais*" can be understood when the listener picks up the harmonica according to the community practices. The listener could learn this through a story of differential reinforcement from the answers to the question: "What is *?", or by the rule: "* is a harmonica in this region". In other words, one only understands the rule if one responds to the relations between "taking" and taking, * and harmonica, etc., according to the community's cultural practices (Albuquerque et al., 2013).

Procedures used in investigation of control by rule

In general, control by rule has been investigated mainly in two ways. In a more traditional way, it is observed whether the behavior previously specified by rule changes when the programmed reinforcement contingencies also change. In another way, it is observed if behavior exposed to the programmed reinforcement contingencies changes when the rule changes. In a more traditional way, the rule is kept unchanged while the programmed reinforcement contingencies in the experiment are manipulated. In an alternative way, programmed reinforcement contingencies in the experiment are kept unchanged while the rules are manipulated (Albuquerque, de Souza, Matos, & Paracampo, 2003).

Defining properties of rule-controlled behavior and behavior controlled by reinforcement contingencies[4]

Rules can make behavior acquisition faster and allow complex behaviors to be acquired (Catania, 1998; Mallot, 1989; Skinner, 1969, 1974). However, a problem exists when by changing contingencies and not rules, rules can be more disruptive than helping (Skinner, 1969). For example, the rule: "Do not touch the pan because it is hot" has the advantage of allowing one to learn not to touch the pan without

4. This section is an updated version of excerpts from the Albuquerque & Paracampo (2010) chapter.

having to burn oneself. But, on the other hand, it has the disadvantage of being able to prevent the behavior of touching the pan from being emitted even after the pan became cold (Albuquerque, Mescouto, & Paracampo, 2011).

There is experimental evidence to support the Skinner's predictions (1969). For instance, there is evidence showing that rule-following can be maintained even when exposed to changes in programmed contingencies (Hayes, Brownstein, Zettle, Rosenfarb, & Korn, 1986b; Shimoff, Catania, & Matthews, 1981). This tendency from rule following not to change when programmed reinforcement contingencies change has been called insensitivity[5] and considered as a defining property of rule-controlled behavior (Shimoff et al., 1981). Paracampo, de Souza, Matos and Albuquerque (2001) compare the effects of rules and reinforcement contingencies on the behavior exposed to changes in programmed contingencies. To do so, children were exposed to a matching to sample procedure, under the control of contextual stimuli, adapted from the one developed by Paracampo (1991). The task was to choose one out of two comparison stimuli, according to the sample, in the presence of a contextual stimulus. To Group 1, in Phase 1, correct behavior [which produced programmed reinforcement - tokens exchangeable to toys in a continuous reinforcement schedule (CRF)] was established by differential reinforcement. To Group 2, in Phase 1, this behavior was established by a rule with justification[6]. To both groups, programmed contingencies

5. Main definitions of this term are: 1) insensitivity of rule following occurs when the behavior previously specified by a rule does not change when programmed reinforcement contingencies change (Shimoff et al., 1981); 2) insensitivity describes lack of behavior alteration after experimental manipulation (Madden, Chase, & Joyce, 1998); and 3) the term insensitivity describes behavior that is not under control of its immediate consequences and the term sensitivity describes the behavior that is under control of its immediate consequences in a certain particular situation (Albuquerque et al., 2003).
6. Justifications are stimuli constituent of rules that when manipulated can alter the stimuli functions, the topography of behavior and its probability of occurring and being maintained (Albuquerque et al., 2013). According to these authors, the main justifications types are verbal antecedent reports due to: 1) possible consequences of rule following or non-following; in reports that may indicate whether the consequences are aversive or reinforcing, from great or small magnitude, near or future, likely to be contacted or not, etc.; 2) the occasional rule following and non-following approval or disapproval; observed in reports that may indicate whether the speaker or other people approve or not that the rule is followed; 3) confidence in the speaker expressed in reports such as "I think", "I am safe", "Trust me", "He has a lot of experience", "It's not a problem", etc., which can indicate whether the consequences reported will actually be produced or not by the rule following; 4) the form of the rule seen in reports that can indicate if the rule has the propaganda, film, promise, order, threat, agreement, speech, etc. form; and, 5) what to observe: reports that may indicate examples of behaviors to be followed or not (Albuquerque et al., 2013; Albuquerque, Silva, & Paracampo, 2014; Matsuo, Albuquerque, & Paracampo, 2014).

occurring in Phase 1 were altered in Phase 2 and reinstated in Phase 3. Phase transitions were not flagged. At each stage participants were asked to describe what they should do to win tokens; verbal responses were never reinforced.

To Group 1 (Differential Reinforcement), participants started Phase 1 with variable performance. Then, five out of eight participants began to respond correctly, according to the reinforcement contingencies. In Phase 2, when programmed contingencies were altered, all five participants who had responded correctly in Phase 1, changed their performances and began to respond correctly, according to the new contingencies in occurrence. In Phase 3, returning to contingencies occurring in Phase 1, all five participants once again changed their performances, according to the variance in contingencies. Verbal behavior described nonverbal behavior, therefore it also changed when the contingencies have altered. To Group 2 (Rule), all six participants followed the rule, previously presented at the beginning of Phase 1, throughout this phase. This performance did not change in subsequent phases with variance in reinforcement contingencies introduced in Phases 2 and 3. Verbal behavior described nonverbal behavior therefore it did not change when contingencies have altered.

Such results from the Paracampo et al. (2001) study support the distinction between rule-controlled behavior and reinforcement contingency-controlled behavior proposed by Albuquerque (2001). According to this distinction, rule-controlled behavior is established by a rule and occurs independently from its immediate consequences. And so reinforcement contingency-controlled behavior is established by its immediate consequences and occurs independently of rules (Albuquerque, 2001).

For instance, data from the Paracampo et al. (2001) study have shown that, although they may present a similar topography, both behaviors are functionally different for they are under control of distinct variables (Skinner, 1963, 1969). In Group 1, nonverbal behavior was established by its immediate consequences, while in Group 2 this behavior was established by rule with justification. Yet, as mentioned, this is not enough to assert that nonverbal behavior was under control of programmed contingencies in Group 1 and under control of rule in Group 2.

In Group 1, Phase 1, there was the possibility that nonverbal behavior was also under control of self-rule, once this behavior was described by participants when requested. To evaluate whether Phase 1 nonverbal behavior was under immediate programmed or self-correcting consequences control, such immediate consequences were manipulated in Phase 2. So, if participants' self-rules were exerting control in Phase 1, both nonverbal and verbal behavior describing nonverbal should remain unchanged in Phase 2, after variance in contingencies. Notwithstanding, if programmed immediate consequences were exerting control in Phase 1, both nonverbal and verbal behavior describing nonverbal should change in Phase 2, after variance in contingencies, and this is what occurred. Thus, in Phases 1 and 2, both nonverbal and verbal behavior describing nonverbal were under control of programmed contingencies.

In Group 2, Phase 1, there was the possibility that nonverbal behavior would also be under control of programmed immediate consequences, once this behavior was reinforced with tokens. To evaluate whether in Phase 1 nonverbal behavior was under control of rule or from its programmed immediate consequences, such consequences were manipulated in Phase 2. Thus, if rule were exerting control in Phase 1, both nonverbal behavior specified by rule and verbal behavior describing nonverbal should remain unchanged in Phase 2, after variance in the contingencies. On the other hand, if programmed immediate consequences were exerting control in Phase 1, both nonverbal and verbal behavior describing non-verbal should change in Phase 2, after variance in contingencies. Both nonverbal and verbal behavior describing nonverbal remained unchanged in Phase 2 and therefore were under control of rule with reported justification.

Another difference between rule-controlled behavior and contingency-controlled behavior, shown in the Paracampo et al. (2001) study, is that when nonverbal behavior is established by its differential immediate consequences (that is, by reinforcement contingencies), both nonverbal and verbal behavior describing nonverbal behavior are likely to change when variance occurs in reinforcement contingencies. Aside this, when nonverbal behavior is established by rule (that is, established by justifications to rule-following), both nonverbal and verbal behavior describing nonverbal behavior are likely to remain unchanged when reinforcement contingencies vary (Paracampo et al., 2001; Shimoff et al., 1981).

This analysis also suggests that a certain particular self-rule may interfere in behavior when the combination of three conditions is satisfied: 1) when self-rule is formulated before the behavior specified by it is established by its immediate consequences or by other variables; 2) behavior specified by self-rule is not previously specified by a rule presented by another person; and, 3) when behavior specified by self-rule occurs regardless of its immediate consequences. By this analysis, then, rule-based control and self-rule control should be evaluated with equal accuracy, according to the same criterion (Albuquerque et al., 2014; Paracampo et al., 2001).

Variables involved in maintaining behavior established by rules

Differences between results of Groups 1 and 2 from the Paracampo et al. (2001) study would be likely to occur, according to Chase and Danforth (1991), because, usually, differential reinforcement procedure would generate behavioral variation, whereas the rule would avoid such variation, in the moment of changing in contingencies. By this proposition, for immediate consequences to be able to select behavior, when contingencies change, behavior would have to vary. And to be able to vary, it would have to be exposed to conditions that could generate behavioral variation as the extinction procedure, differential reinforcement procedure and rule presentation with justification, so specified behavior can vary (Baumann, Abreu-Rodrigues, & Souza, 2009, Chase & Danforth, 1991, Joyce & Chase 1990, LeFrancois, Chase, & Joyce 1988, Santos, Paracampo, & Albuquerque, 2004).

Nevertheless, rule-following maintenance, despite change in programmed contingencies observed in some studies (Catania et al., 1982; Hayes et al., 1986b; Paracampo et al., 2001) may also have occurred because in such studies programmed contingencies were weak, that is, in such studies it was not demonstrated control by reinforcement contingencies before introduction of rule (Torgrud & Holborn, 1990). A problem, however, is that there is also experimental evidence questioning these arguments.

For instance, Albuquerque et al. (2003) conducted two experiments with the intent of evaluating effects of an experimental history[7] of control by interaction between

7. In general rules play their role due in part to nowadays environmental variables (such as immediate consequences and justifications to rule following and non-following) and to historical variables (such as history of control by differential immediate consequences, and the history of control by the interaction between immediate consequences and justifications to rule following and non-following) (Albuquerque et al., 2013; Albuquerque et al., 2014).

immediate consequences and justifications to follow correspondent rule on discrepant rule following subsequent behavior. Therefore, 16 college students (eight in each experiment) were exposed to a choice procedure according to the sample, adapted from the one developed by Albuquerque (1991)[8]. In each attempt it was presented to a student a stimuli arrangement, consisting of a sample stimulus and three comparison stimuli. Each comparison stimulus had only one color (C), thickness (T) or shape (S) dimension in common to the sample and differing among others. In the presence of such stimuli, a student should point the stimuli of comparison in a given sequence.

Correspondent and discrepant rules contained justification from Type 2 (reports on whether to approve or disapprove rule following or non rule following - "When I show you these objects, you should do:") which indicated that a participant should emit the behavior specified by rule; and, justification from Type 1 (reports on possible consequences of rule following and non-rule following - "In doing so, you can earn points, which will be shown in the counter in front of you"), which indicated that a participant would earn exchangeable points for money if emitting the sequence specified by rule, that is, if following the rule[9].

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8. This procedure was used because in relation to the multiple schedule traditionally used in this area (Baron & Galizio, 1983; Hayes et al., 1986) it has the advantage of offering several possibilities of combinations and recombinations between the stimuli that constitute rules with justifications and the stimuli that constitute the conditions under which rule following occurs. This procedure characteristic used here is what allows evaluating, in each attempt, in one same participant, the effects of control by reinforcement contingencies, rules with justifications, and experimental history on previously specified behaviors (Albuquerque, 2001; Albuquerque & Silva, 2006).
9. Three aspects must be clarified: a) future events reported in justifications (the report in which the participant may gain points, for example) are verbal antecedent stimuli constituent of the rule and can exert control over behavior in the moment the rule is presented when the listener contacts the rule. But the future event reported (the points, for example) itself does not exert control over behavior because this event is not produced by the behavior in the moment the rule is presented. When the reported event starts to be produced by behavior (behavior produces point, for example) it is not produced as a future event yet rather as a behavior immediate consequence and it is how it can exert control. Thus the rule would function as a current substitute for the future event reported by it (Albuquerque et al., 2014; Matsuo et al., 2014; Paracampo et al., 2013b); b) a behavior and a future event may be part of a reinforcement contingency. When this relation is thereby described to a listener and the behavior specified by that rule occurs before contacting the reported event, such behavior should be considered as rule-controlled (Paracampo et al., 2013b); and, c) the future event reported by the justification is not always liable of being produced (case of justifications stating that rule following will produce, for example, God's blessing, paradise or hell after death, etc.) or is clearly produced (case of justifications that report rule following will produce, for example, approval, admiration, happiness, safety, health, etc.) by the behavior specified by the rule. In such cases, the approval is as justification and not as immediate consequence (Albuquerque et al., 2011; Albuquerque et al., 2014; Matsuo et al., 2014).

The rule was called correspondent when the immediate consequence produced by rule specified behavior corresponded to justification Type 1 constituent of rule. That is, in this case, when rule following produced points. And the rule was called discrepant when the immediate consequence produced by rule specified behavior did not correspond to justification Type 1 constituent of rule. That is, in this case, when rule following did not produce points.

In Experiment 1, correspondent-discrepant Condition (CD), four participants were exposed to the minimum rule in Phase 1 (which specified that the participant's task was pointing to the comparison stimuli, it did not specify the sequence that one should point though), to the correspondent rule in Phase 2 (which specified the TSC sequence) and to the discrepant rule in Phase 3 (which specified the SCT sequence). In Condition DCD, four other participants were exposed to the minimum, discrepant, correspondent and discrepant rules at the beginning of Phases 1, 2, 3 and 4, respectively. Under both conditions, no sequence produced points (that is, was reinforced) in Phase 1. In all other phases, the CTS sequence was reinforced in fixed ratio schedule 4 (FR 4). All eight participants followed the rules. CD Condition results could suggest that participants followed discrepant rule in Phase 3 due in part to the story constructed in Phase 2. However, Phase 2 results of DCD Condition show that discrepant rule following can be maintained even when such experimental history is not part of the participant's behavior repertoire. It is possible that the behavior established by discrepant rule in Phase 2 of Condition DCD has been maintained due to justification Type 2 constituent of this rule (Albuquerque & Paracampo, submitted). But it is also possible that discrepant rule following was maintained for programmed immediate consequences were weak (Cerutti, 1989), that is, control for such immediate consequences was not demonstrated prior to submission of rules to the participant (Torgrud & Holborn, 1990). Experiment 2 attempted to test this possibility.

In Experiment 2, eight participants with no previous experience with this type of experiment were exposed to a procedure that differed from that used in the DCD Condition of Experiment 1 in only two aspects: in Experiment 2 it was attempted to demonstrate control by reinforcement contingencies in the Phase 1, before introduction of rules in Phases 2, 3 and 4, and the emission of shaped behavior maintained in

schedule FR 4 in Phase 1 continued to be reinforced in all other subsequent phases (an alternative behavior to that specified by discrepant rule, that is, a behavior that replaces the behavior specified by discrepant rule). Specifically, in Experiment 2, Phase 1, the CTS sequence was established by differential reinforcement in CRF and then a gradual approximation was made to the value of the fixed ratio schedule 4 (shaping). In Phases 2, 3 and 4, the CTS sequence continued to be reinforced in FR 4. In Phase 3, the TSC sequence specified by correspondent rule was also reinforced in FR 4, concurrently with CTS. Emission of any other sequence, including SCT specified by discrepant rule in Phases 2 and 4, was not reinforced.

Thus if rules are unlikely to exert control over behavior when, prior to its introduction, discriminative control by reinforcement contingencies is established, as suggested by Torgrud and Holborn (1990), and if such control was demonstrated in Phase 1 then it should be expected that the behavior specified by discrepant rule would not be installed in Phase 2, once the following of this rule would not be reinforced (would not produce points) in that phase, while alternative behavior to that specified by discrepant rule, established by differential reinforcement in Phase 1, would continue to be reinforced.

On the other hand, if it is considered that behavior specified by rules is more likely to be maintained when it is reinforced (Baron & Galizio, 1983; Cerutti, 1991; Galizio, 1979; Joyce & Chase, 1990; Michael & Bernstein, Galizio, & Baron, 1988), then it should be expected that behavior specified by correspondent rule would be maintained in Phase 3, once it started to be reinforced. If so, what would occur in Phase 4, when discrepant rule was presented again? Would behavior specified by discrepant rule be maintained or abandoned? If maintained, would the following of discrepant rule be maintained due to the history constructed in Phase 3? If it is abandoned, which behavior would replace the behavior specified by discrepant rule? Behavior established by differential reinforcement in Phase 1, once it would continue to be reinforced in Phase 4, or behavior previously specified by correspondent rule in Phase 3?

Results from Experiment 2 showed that the CTS sequence was shaped in six participants in Phase 1. From those six, four followed rules and two failed to follow the rules in subsequent phases. Those two, by failing to follow the rules, started to present

alternative behavior to that specified by the rule (the CTS sequence, previously shaped in Phase 1). Results from those four participants who followed the rules suggest that rules with reported justifications can maintain the behavior specified by them even when it produces immediate consequences that contradict justifications and there is evidence that such immediate consequences are strong, that is, even when it is demonstrated control by such immediate consequences before the listener is exposed to discrepant rule. In addition, the results from those four participants demonstrate that rules with justifications can both alter stimuli functions and determine topography of a new behavior regardless their immediate consequences (Albuquerque & Ferreira, 2001; Albuquerque et al., 2013).

It can be affirmed that rules with reported justifications determined the topographies of behaviors because the topographical characteristics from participants' behaviors that followed rule changed from the CTS sequence in Phase 1 to the SCT sequence in Phase 2 and from the SCT sequence in Phase 2 to the TSC sequence in Phase 3 and from the TSC sequence in Phase 3 to the SCT sequence in Phase 4 due to changes in the rules with Type 2 justifications reported in Phases 2, 3 and 4. In other words, justification from Type 2 (in this case, indication that the participant should emit the behavior specified by rule) was for the participant to emit SCT in Phase 2, the TSC sequence in Phase 3 and the SCT sequence in Phase 4. It cannot be said that such changes in topography of sequences between the phases occurred because of the programmed reinforcement contingencies, for such contingencies were the same during Phases 2, 3 and 4. It also cannot be said that the differences between Phase 2, 3 and 4 performances were determined by the sample and comparison stimuli dimensions, once the stimuli arrangements used in Phase 2 were the same as those used in Phases 3 and 4. For these same reasons, it can also be affirmed that rules with justifications altered the functions from the sample and comparison stimuli dimensions, because these dimensions worked as discriminative stimuli for the SCT, TSC and SCT sequences in Phases 2, 3 and 4, respectively, due to changes in justifications between phases. Such results support the Albuquerque et al.'s definition of rules (2013).

An explanation for the results from the Albuquerque et al. (2003) study would be to say that the behavior specified by discrepant rule was maintained, because in this

study the programmed schedule to reinforce the following of correspondent rule and the non-following of discrepant rule was an intermittent reinforcement schedule. By this proposition, different from what Shimoff et al. (1981) suggest, the insensitivity of following rules to programmed contingencies would not be a defining property of rule-governed behavior. Thus, rule following may have been maintained in the Albuquerque et al. (2003) study more as a result of the programmed reinforcement schedule to reinforce rule following and non-following than due to an inherent property of rules themselves (Newman, Buffington, & Hemmes, 1995).

Nevertheless, there is experimental evidence showing that the following of contingencies discrepant rules can be maintained even when the programmed schedule used to reinforce rule following and non-following is a continuous reinforcement schedule (Albuquerque, Reis, & Paracampo, 2006; Monteles, Paracampo, & Albuquerque, 2006; Paracampo et al., 2001; Paracampo & Albuquerque, 2004).

For instance, Albuquerque et al. (2006) exposed 16 college students to a choice procedure according to the sample that differed from one previous used by Albuquerque et al. (2003), mainly because a continuous reinforcement schedule (CRF) was used, not an FR 4 schedule. In the Albuquerque et al. (2006) study, two experiments were executed. In Experiment 1, it was demonstrated no control to the reinforcement contingencies prior to the introduction of rules, while in Experiment 2 such control was demonstrated.

In Experiment 1, Condition CD, four participants were exposed to the minimum, correspondent (specified TSC) and discrepant (specified SCT) rules at the beginning of Phases 1, 2 and 3, respectively. In Condition DCD, four other participants were exposed to the minimum, discrepant, correspondent and discrepant rules at the beginning of Phases 1, 2, 3 and 4, respectively. Under both conditions, Phase 1 (baseline) was terminated after ten attempts and each of the other phases was terminated according to one of the following criterion, whichever occurred first: 1) after 80 points supply or 2) after 240 attempts occurrence. In Phase 1 no sequence was reinforced and in all the other phases the TSC sequence was reinforced in CRF.

In Experiment 2, the same eight participants were also distributed in two conditions. Although Experiment 2 differed from Experiment 1 in two aspects: Experiment 2 attempted to demonstrate control over contingencies in Phase 1 before the introduction of rules in Phases 2, 3, and 4, and emission of the established sequence by differential reinforcement in Phase 1 (alternative behavior to that one specified by the rules) continued to be reinforced in subsequent phases. Thus under the two conditions from Experiment 2, Phase 1 was started with the minimum rule (no sequence specified) and the CTS sequence was established and maintained by differential reinforcement in CRF until the 20 point supply. Later, this sequence was no longer reinforced (extinction) for 80 attempts. Then, the CTS sequence was reinforced until the 320 CRF points supply, when that phase was terminated. Shortly after Phase 1, in the differential reinforcement - correspondent-discrepant Condition (dR/CD), four participants were exposed to the correspondent and discrepant rules at the beginning of Phases 2 and 3, respectively; and in the dR/DCD Condition, four other participants were exposed to the discrepant, correspondent and discrepant rules at the beginning of Phases 2, 3 and 4, respectively.

In Experiment 1, all participants presented a variable performance in the baseline phase and all followed the correspondent and discrepant rules in the other phases. In Experiment 2, all participants reached Phase 1 termination criterion. In Condition dR/CD, all four participants followed the correspondent rule in Phase 2. In Phase 3, one of them followed and three stopped following the discrepant rule. In Condition dR/DCD, all four participants stopped following the discrepant rule in Phases 2 and 4. In Phase 3, three of them followed and one did not follow the correspondent rule.

Results of the Albuquerque et al. (2003) and Albuquerque et al. (2006) studies combined suggest that when the alternative behavior to that specified by the discrepant rule is not established by its immediate consequences, before the rule is presented to the listener, such behavior specified by the discrepant rule can be maintained independently from the programmed reinforcement schedule to reinforce the rule following or non-following behavior as a continuous reinforcement schedule or an intermittent reinforcement schedule (comparisons between results from Experiment 1 of

the combined studies under examination). However, when the alternative behavior to that specified by the discrepant rule is established by its immediate consequences, prior to the presentation of the rule to the listener, it is more likely that the behavior specified by the discrepant rule is maintained when, in the listener's history preceding the presentation of the rule, the alternative behavior is reinforced in an intermittent reinforcement schedule than when this behavior is reinforced in a continuous reinforcement schedule (comparisons between results from Experiment 2 of the combined studies under examination).

Nonetheless, this analysis from the results of the Albuquerque et al. (2003) and Albuquerque et al. (2006) studies, does not make it clear if what is critical to the discrepant rule following from contingencies ceases to occur, is how alternative behavior to that specified by the rule is initially established (by rules with justifications or by immediate consequences) or is the fact that this behavior is shown under control of reinforcement contingencies, before the rule is presented to the listener (Albuquerque & Silva, 2006). Considering this, some studies have begun trying to identify which critical characteristics that a listener's history must present in order to interfere in the installation or maintenance of the behavior specified by the discrepant rule (Albuquerque et al., 2013; Albuquerque et al., 2004; Albuquerque, Reis, & Paracampo, 2008; Albuquerque & Silva, 2006; Silva & Albuquerque, 2007; Silva & Albuquerque, 2006).

For instance, in Experiment 2 from the Albuquerque et al. (2008) study, a systematic replication was made from the CD Condition of Experiment 1 from the Albuquerque et al. (2006) study with the objective of investigating effects of a prolonged experimental history of control by the interaction between immediate consequences and justifications to the behavior specified by correspondent rule and reinforced in CRF. Studies differed mainly regarding the extent of Phase 2 (that is, from experimental history). Phase 2 from the Albuquerque et al. (2006) study was terminated after 80 points supply in CRF (short history), while Phase 2 from Experiment 2 of the Albuquerque et al. (2008) study was terminated after 320 points supply in CRF (long history).

So, in Experiment 2 from the Albuquerque et al. (2008) study, Phase 1 was initiated with the presentation of the minimum rule, Phase 2 the correspondent rule, and Phase 3 the discrepant rule. In Phase 1 (baseline), three out of four participants presented variable performance. In Phase 2, when correspondent rule was presented, all four participants followed this rule. In Phase 3, different from the results of CD Condition of Experiment 1 from the Albuquerque et al. (2006) study, all four participants stopped following the discrepant rule and began to emit the alternative behavior, previously established by rule in Phase 2.

Combined, the results of the Experiment 1 CD Condition from the Albuquerque et al. (2006 - short history) study and the results of Experiment 2 from the Albuquerque et al. (2008 - long history) study, suggest that a history of control by the interaction between immediate consequences and justifications to the reinforced correspondent rule following in CRF is more likely contributing to intercept the maintenance of the subsequent following of a discrepant rule when that history is long rather than short. This occurs when the extent of this history is measured by the number of reinforcements provided for the emission of the behavior established by the correspondent rule.

The results of Experiment 2 from the Albuquerque et al. (2008) study, combined with the results of the dR/DCD Condition of Experiment 2 from the Albuquerque et al. (2006) study, suggest that a long experimental history of reinforced behavior in CRF (alternative behavior to that specified by the discrepant rule) constructed before the listener is exposed to a discrepant rule may contribute to prevent subsequent installation or maintenance of the behavior specified by the discrepant rule, regardless of whether this alternative behavior is initially established by immediate consequences [case of Experiment 2 from the Albuquerque et al. (2006) study] or by correspondent rules with justifications [case of Experiment 2 from the Albuquerque et al. (2008) study]. It is possible that in both studies there reinforcement extended history in CRF has made the emitted behavior prior to the presentation of the discrepant rule dependent of its immediate consequences and this listener's history characteristic has been critical for the discrepant rule following to stop occurring. This proposition is based on the results of a series of related studies that have investigated the effects on subsequent following

of discrepant rules of the history of dependence and independence of behavior emitted before the presentation of the discrepant rule to its immediate consequences (Albuquerque et al., 2013; Albuquerque et al., 2014; Albuquerque & Silva, 2006; Silva & Albuquerque, 2006; Silva & Albuquerque, 2007).

For instance, Albuquerque and Silva (2006) compared the effects of three specific listener's histories on the subsequent following of discrepant rule. Histories differed as to the form of initial behavior establishment (by immediate consequences, or by correspondent rule with justifications to verbal behavior, or by correspondent rule with justifications to nonverbal behavior). Once established, the dependence on this behavior was tested for changes in programmed immediate consequences. This was made to evaluate whether the behavior dependence or independence on its immediate consequences, prior to the presentation of discrepant rule, interferes in maintenance of subsequent following of discrepant rule. Therefore, nine college students were exposed to a choice procedure according to the sample, adapted from the one developed by Albuquerque (1991). Participants' task was to point to each of the three comparison stimuli in sequence. Participants were distributed into three groups, each one with three participants. To the three groups, during Phases 1, 3 and 4, when the left light was on, the correct (reinforced) sequence was color (C), thickness (T) and shape (S), and when the right light was on, correct sequence was SCT. In Phase 2, correct sequences were the TCS sequences in presence of left light and CST in presence of right light. So, programmed contingencies in Phase 1 were changed in Phase 2, recovered in Phase 3 and kept unchanged in Phase 4, which was initiated with the presentation of the discrepant rule [specified the incorrect (not reinforced) sequences STC and TSC in the presence of left and right lights, respectively]. Transitions from Phase 1 to Phase 2 and from Phase 2 to Phase 3 were marked only by not signalized change in the programmed contingencies, once no rules were presented in those transitions. Transition from Phase 3 to Phase 4 was marked by the introduction of discrepant rule, once programmed contingencies were kept unchanged in this transition. The correct sequences produced points (exchanged for money at the end of research) in a continuous reinforcement schedule (CRF). Besides, throughout the experiment

participants were asked to describe the correct sequences and their correct verbalizations were reinforced.

Three groups differed on the rules presented in the beginning of Phase 1. In Phase 1, participants in Group 1 (P11, P12 and P13) were exposed to the minimum rule; Group 2 (P21, P22 and P23) were exposed to the correspondent rule with justifications to nonverbal behavior (which specified that the participant should point in the CTS and SCT sequences in the presence of left and right light, respectively); and those in Group 3 (P31, P32 and P33) were exposed to the correspondent rule with justifications to verbal behavior [which specified that the participant should write "color-thickness-shape" and "shape-color-thickness" in response to questions (made along the experiment) regarding left and right lights, respectively)].

In Phase 1, participants' verbal and nonverbal behaviors were established by differential reinforcement [case of P11, P12, P13 and P32 (P32 did not follow the rule, once his performance varied before reaching the performance criterion for this phase's termination)] or by rules (case of P21, P22, P23, P31 and P33). From these nine, seven participants (P11, P12, P13, P21, P22, P31 and P32) changed both nonverbal and verbal behavior that described nonverbal behavior when reinforcement contingencies altered in Phases 2 and 3; and two (P23 and P33) did not change their performances in Phases 2 and 3, that is, they continued to present the same verbal and nonverbal performances presented in Phase 1. Seven participants (P11, P12, P13, P21, P22, P31 and P32) who changed their behaviors when contingencies were altered in Phases 2 and 3, stopped following the discrepant rule in Phase 4, and both (P23 and P33) who did not change their behaviors when contingencies were altered in Phases 2 and 3 followed the discrepant rule in Phase 4.

Similar results to the ones from Albuquerque and Silva (2006) were found in related studies (Albuquerque et al., 2013; Albuquerque et al., 2014; Silva & Albuquerque, 2007; Silva & Albuquerque, 2006). Together the results of such studies suggest that behavior's dependence and independence to its immediate consequences prior to the presentation of discrepant rule are critical variables of the listener's history that can be used to predict maintenance or not of the subsequent following of discrepant rule. Thus it may be said that behavior specified by a discrepant rule is likely

to be established and maintained when the listener's behavior in the history preceding the presentation of that rule is maintained independently of its immediate consequences, that is, it is not shown under control of its immediate consequences (case of P23 and P33, for example). And the behavior specified by a discrepant rule is likely not to occur or not to be maintained when the listener's behavior in the history preceding the presentation of this rule is maintained dependently on its immediate consequences, that is, it is shown under control of its immediate consequences (case of P11, P12, P13, P21, P22, P31 and P32, for example).

Hence, discrepant rules will be followed or not depending in part on the relations between the combined variables favorable and not favorable to the dependence or independence from both the behavior presented by the listener before his contact with the discrepant rule, and the one specified by this rule, to their respective immediate consequences. Examples of such combined variables (or control sources) are: establishment form of behavior maintained before the presentation of discrepant rule (whether by rules with justifications or by immediate consequences), types of justifications to maintain this behavior and the following of discrepant rule, types of immediate consequences produced from both behaviors, among others (Albuquerque et al., 2013; Albuquerque & Paracampo, in press).

Role of pre-experimental history in determining behavior specified by rules

One of the main problems in research areas that investigate human behavior is to explain the variability amongst participant performances observed within one same experimental phase. Specifically in the area that investigates rules functions this variability is related to the rule following and non-following (Albuquerque, 2005). Generally, variability observed within one same experimental phase, often found in studies investigating rules functions (for example, Albuquerque et al., 2003; Hayes et al., 2006b; LeFrancois et al., 1988; Newman et al., 1995; Oliveira & Albuquerque, 2007; Perez et al., 2009; Paracampo & Albuquerque, 2004; Shimoff et al., 1981) has been attributed mainly to the effects of historical variables (Weiner, 1983).

Other authors also consider pre-experimental history important. According to Skinner (1963), programmed contingencies into an experimental situation are only effective combined with the behavior that the organism brings to the experiment. Consistent with this view, Hayes et al. (1986b) assumed that humans arrive at the laboratory with long reinforcement histories to respond them according to rules and the behavior controlled by such history could be little affected by the programmed immediate consequences within a brief experiment. These assumptions, however, are difficult to test for the effects of pre-experimental histories, by definition, cannot be investigated experimentally (Wanchisen, 1990).

Still, the effects of pre-experimental histories can be inferred. An example of this is the Wulfert, Greenway, Farkas, Hayes and Douguer (1994) study, who evaluated the hypothesis that the insensitivity phenomenon of rule-controlled behavior to programmed reinforcement contingencies in experimental situations may be related to individual differences amongst participants. According to such authors, the exposure history to differential immediate consequences for the rule following and non-following from each individual could contribute to produce repertoires of flexible or inflexible rule following. In other words, this pre-experimental history could contribute to produce more or less rule followers individuals than others and therefore more or less sensitive to the behavior's immediate consequences.

To Wulfert et al. (1994) the effects of this pre-experimental history could be inferred from participants' responses to the questionnaire developed by Rehfisch (1958) named Scale for Personality Rigidity. This scale would allow identifying rule following tendency listeners and rule non-following tendency listeners due to their pre-experimental histories, for it has been validated and would contain items such as "I always follow the rule: business before pleasure" (Item 9 from the questionnaire). And because in response to a statement like Item 9, some participants would tend to report that it is true (participants whom tend to agree with statements like this are exactly those whom at the end of the questionnaire application are classified as inflexible) and others would tend to report that it is false (participants whom tend to disagree with such statements are exactly those whom at the end of the questionnaire application are classified as flexible) (Paracampo, Souza, & Albuquerque, 2014).

Yet the listener's pre-experimental history is not constituted only of control for differential immediate consequences to rule following and non-following. Such a history also is constituted of justifications that select which rules examples should be followed and which rules examples should not be followed. In other words, listeners throughout their histories are exposed to justifications often competitive, such as those available in the media, to make their choices. For instance, they may be exposed both to Type 1 justifications (reports of occasional consequences of rule following or non-following) to follow rules prioritizing behaviors related to career success, and to Type 1 justifications to follow rules prioritizing behaviors related to leisure time. Besides, listeners can learn from Type 5 justifications (reports on what to observe) reported in other people and movie characters' histories, books, etc. In this way, the listener can see, read or hear histories of people whom are examples to be followed, for they are admired for being critical, questioning, innovative, etc. But also the listener can see, read or hear histories of people whom are examples to be followed, for they usually do what they are told to, what is correct, legal, ethical, moral, valued and thus by living without major annoyance. Such histories of exposure to such differential justifications for rule following and non-following in certain situations may contribute to the formation of an adaptive repertoire, even if this implies being a rule follower in one situation and being a rule non-follower in another (Albuquerque & Paracampo, in press).

Similar to historical variables, current environmental variables, including those present in an experimental situation, may also contribute to the occurrence of behavioral differences, both among individuals from the same situation and from one same individual in different situations. According to some authors (Albuquerque et al., 2003; Oliveira & Albuquerque, 2007) variability in results found in some studies cannot be attributed exclusively to the effects of pre-experimental histories, once it does not occur in any or every phase. To these authors, the fact that this variability is more likely to occur in phases that favor in a more balanced way both the maintenance and abandonment of rule following suggests that the occasional effects of pre-experimental histories on the behavior depend on nowadays environmental variables.

By this analysis, a way of testing this proposition (Albuquerque et al., 2003; Oliveira & Albuquerque, 2007) would be to expose participants previously classified as

inflexible and flexible, according to their responses to the questionnaire developed by Rehfisch (1958) to a condition in which is often observed a tendency to not occurring variability (condition without variability) and the other condition in which is often observed a tendency to variability in results (condition with variability).

Thus if the results of the condition without variability were replicated regardless of the participants' classification and if the variability condition's results were also replicated, but whether it was proved that the participants whom followed the rule had been classified as inflexible and the participants whom stopped following the rule had been classified as flexible, it could have been specified that the conditions under which historical variables would be more or less likely to exert their possible effects.

Although, whether both in condition without variability and in condition with variability, it was proved that the participants who had been classified as inflexible followed the rule and the participants who had been classified as flexible stopped following the rule, it could have been assumed that the effects of pre-experimental histories inferred from participants' responses to the questionnaire developed by Rehfisch (1958) may occur independently of the experimental conditions investigated.

Paracampo et al. (2014) study tried to test such possibilities. In the latter, the Experiment 2 procedure of Albuquerque et al. (2003) study was employed as a condition with variability, and the dR/DCD Condition procedure of Experiment 2 from the Albuquerque et al. (2006) study was employed as condition without variability. The study under examination (Paracampo et al., 2014) consisted of two stages. In the first one, 175 college students were exposed to the inflexibility questionnaire. In the second stage, 16 students (8 flexible and 8 inflexible) out of the 175 who participated in the first stage, were distributed in two experimental conditions. In Condition 1 (CRF – without variability), four participants who presented self-reports classified as flexible and four participants who presented self-reports classified as inflexible, were exposed to the minimum, discrepant, correspondent and discrepant rules in the beginning of Phases 2, 3 and 4 respectively, such as the participants from the dR/DCD Condition of Experiment 2 from the Albuquerque et al. (2006) study. In Condition 2 (FR 4 – with variability), four flexible and four inflexible participants were exposed to the minimum, discrepant,

correspondent and discrepant rules in the beginning of Phases 2, 3 and 4, respectively, such as the participants in Experiment 2 from the Albuquerque et al. (2003) study.

Results of Phases 2 and 4 from Condition 1 (CRF – without variability) replicated the results of Phases 2 and 4 from the dR/DCD Condition of Experiment 2 from the Albuquerque et al. (2006) study, once all participants from these two conditions, without exception, stopped following the discrepant rule in Phases 2 and 4. In addition, results of Condition 1 (CRF – without variability) from the (Paracampo et al., 2014) study under examination, in a similar way to the results found by Pinto, Paracampo and Albuquerque (2008) signalized that all participants stopped following the discrepant rule, regardless of the differences amongst their pre-experimental histories, that is, regardless of whether participants were flexible or inflexible. Therefore the variables present in these two stages did not favor the effects from pre-experimental histories in determining individual differences.

The variables present in Phase 3 of the two conditions also did not favor the effects of pre-experimental histories in determining individual differences, once 15 out of 16 participants, regardless of whether the participant was flexible or inflexible, followed the correspondent rule in this phase.

Differently the results from Phases 2 and 4 of Condition 2 (FR 4 – with variability) favored the effects of pre-experimental histories in determining individual differences. Such results replicated in large part the results of Phases 2 and 4 from Experiment 2 of the Albuquerque et al. (2003) study. In the latter, 67% (4 out of 6) of the participants followed the discrepant rule in Phases 2 and 4, while in Condition 2 (FR 4 – with variability) from the study under examination, 62% (5 out of 8) and 37% (3 out of 8) of the participants followed the discrepant rule in Phases 2 and 4, respectively. The difference was that in Condition 2 (FR 4 – with variability) from the study under examination, all participants who followed the discrepant rule were inflexible and, with the exception of one inflexible participant who stopped following the discrepant rule in Phase 4, all other participants who did not follow the discrepant rule were flexible. These data are similar to those found by Wulfert et al. (1994) and Pinto, Paracampo and Albuquerque (2006) and support the suggestion of previous studies (Pinto et al., 2006, 2008; Wulfert et al., 1994) that it is possible to infer, based on the participants'

responses to the questionnaire developed by Rehfisch (1958), that flexible and inflexible participants have different pre-experimental histories of rule following. However, as highlighted (Paracampo et al., 2014; Pinto et al., 2008), such responses to the questionnaire do not indicate the specific type of rule following history from each participant, that is, don't indicate whether the history is of control by differential immediate consequences, or control by differential justifications, or yet control by the interaction between immediate consequences and justifications, to rule following and non-following (Albuquerque & Paracampo, in press).

In synthesis, results support the proposition that the occasional effects of pre-experimental histories on the determination of individual differences depend in a large part on nowadays environmental variables (Albuquerque et al., 2003; Oliveira & Albuquerque, 2007). In other words, it is nowadays environmental variables that favor or not the effects of pre-experimental histories in determining individual differences (Paracampo et al., 2014).

Dependence and independence of behavior established by rule to its immediate consequences

The previously analyzed experimental results support the proposition of distinction between rule-controlled behavior and reinforcement contingencies-controlled behavior, proposed by Albuquerque (2001). According to this proposition, a certain particular behavior may be told as rule-controlled, when such behavior is established by a rule and occurs regardless of its immediate consequences (as was observed, for instance, in Phase 2 from the four participants who followed the discrepant rule in the Albuquerque et al., 2003 study). This does not imply that such behavior (the one specified by rule) cannot be affected by its immediate consequences. Rule following can be affected by its immediate consequences. Nevertheless when it occurs this behavior is no longer rule-controlled. When behavior specified by a rule is affected by its immediate consequences it becomes either controlled by the interaction between rule and reinforcement contingencies (as it was observed in Phase 2 of

Experiment 2 from the Albuquerque et al., 2008 study) or controlled by such contingencies (as it was observed in Phase 3 of Experiment 2 from the Albuquerque et al., 2008 study). So, by this proposition, not every behavior established by rule can be classified as rule-controlled, as it has been suggested (Catania et al., 1989; Hayes, Brownstein, Haas, & Greenway, 1986a; Shimoff, Matthews, & Catania, 1986). Likewise, it cannot be stated every time that after rule following is affected by its immediate consequences such behavior starts being reinforcement contingencies-controlled (Andronis, 1991; Joyce & Chase, 1990). For instance, it cannot be safely stated that in Phase 2 of Experiment 2 from the Albuquerque et al. (2008) study, the behavior that followed the presentation of correspondent rule was under the exclusive control of the rule or under the exclusive control of programmed reinforcement contingencies. The data signalize that all participants of Experiment 2 from the Albuquerque et al. (2008) study modified their performances according to changes in the rules with justifications in the transition from Phase 1 to Phase 2 and from Phase 2 to Phase 3, data indicate that their performances changed in the beginning of Phases 2 and 3 under control of rules with justifications. But the data signalizing that all four participants followed the rule in Phase 2, when rule following produced point, and stopped following the rule in Phase 3, when rule following did not produce point, it indicate that rule following was maintained in Phase 2 in part because it produced point and rule following stopped occurring in Phase 3 because it did not produce point, and the alternative behavior to the one specified by the discrepant rule (established by correspondent rule in Phase 2) produced this immediate consequence. Therefore in Experiment 2 from the Albuquerque et al. (2008) study, rule following was affected by its immediate consequences. In Phase 2, behavior was established by the rule and its maintenance depended in part on Type 1 justifications (the promise of exchangeable points for money) and their immediate consequences. In Phase 3, the alternative behavior that replaced the behavior specified by the discrepant rule, when it stopped occurring, was established and maintained by its immediate consequences. Therein it can be stated that in Phase 2 the behavior was under control of the interaction between the justification of Type 1 for the rule following and the immediate consequences produced by this behavior, and in Phase 3 the alternative behavior to the one specified by the

discrepant rule was under control of its immediate consequences (Albuquerque et al., 2008).

This analysis suggests that insensitivity to programmed immediate consequences should not be considered a defining property of rule-controlled behavior for such behavior may be sensitive to such immediate consequences (Albuquerque et al., 2003; Albuquerque et al., 2008). Thus rule-controlled behavior should be defined on the basis of its independence regarding the immediate consequences produced by it and not based in its insensitivity to such immediate consequences. The replacement of term insensitivity to independence in the description of control by rules has the advantage of allowing a clear distinction amongst the rule-controlled behavior, the reinforcement contingencies-controlled behavior, and the behavior controlled by the interaction between rules and such contingencies, as showed by the analysis in the previous paragraph (Albuquerque, Matos, de Souza, & Paracampo, 2004; Albuquerque et al., 2008).

So the term independence should be used to describe behavior that is not under control of its immediate consequences, and the term dependence should be used to describe behavior that is under control of its immediate consequences in a certain particular situation (Albuquerque et al., 2003; Albuquerque et al., 2008; Albuquerque & Paracampo, 2010; Albuquerque & Paracampo, in press). By these definitions, a criterion to evaluate behavior dependence or independence is to verify whether the behavior occurs dependently (that is, under control) of its immediate consequences or whether it occurs independently (that is, not under control) from such consequences. This can be done in at least two ways: 1) keeping unchanged the programmed reinforcement contingencies in the experiment and manipulating the rules (alternative procedure); and 2) keeping the rules unaltered and manipulating the programmed reinforcement contingencies in the experiment (traditional procedure). Therefore such definitions allow to describe both the studies' data that have used the traditional procedure (Braga, Albuquerque, Paracampo, & Santos, 2010; Baron et al., 1969; Catania et al., 1989; Barret, Deitz, Gaydos, & Quinn, 1987; Galizio, 1979; Hayes et al., 1986b; Joyce & Chase, 1990; LeFrancois et al., 1988; Lowe, 1979; Martinez & Tomayo, 2005; Newman, et al., 1995; Okoughi, 1999; Otto, Torgrud, & Holborn, 1999;

Paracampo & Albuquerque, 2004; Paracampo et al., 2001; Shimoff et al., 1981; Torgrud & Holborn, 1990; Weiner, 1970) and data from studies that have used the alternative procedure (Albuquerque et al., 2003; Albuquerque et al., 2004; Albuquerque et al., 2006; DeGrandpre & Buskist, 1991; Martinez & Tomayo, 2005) and data from studies that have used a procedure that combines the characteristics of those two procedures just mentioned (Albuquerque et al., 2013; Albuquerque et al., 2014; Albuquerque & Silva, 2006; Silva & Albuquerque, 2007; Silva & Albuquerque, 2006).

A favorable argument for maintaining the terms sensitivity and insensitivity would be that they are well established in the literature (Albuquerque et al., 2008). An unfavorable argument however is that such terms, to some authors (Newman et al., 2005; Perez et al., 2009, for example) incorrectly indicate that rule-following is not affected by its immediate consequences. Moreover, even when the term insensitivity has been used as a descriptive term not as an explanatory term, the most frequently used definitions of it are limited in a way that they do not consider all the procedures used in the area investigating the rules functions.

The definitions of insensitivity often used in the literature (Madden et al., 1998, Shimoff et al., 1981) could be adequate in describing results of studies that have used the traditional procedure, that is, have investigated control by rules in situations which the rule is kept unchanged while the programmed reinforcement contingencies in the experiment are manipulated. However, these insensitivity definitions do not seem adequate in describing the results of studies that have used the alternative procedure, that is, have investigated control by rules in situations where the programmed reinforcement contingencies in the experiment are kept unchanged while the rules are manipulated.

For instance, the definition suggesting that rule following insensitivity occurs when the behavior previously specified by a rule does not alter when programmed reinforcement contingencies change (Shimoff et al., 1981) could only be used to describe the behavior exposed to such kind of manipulation (change in contingencies) and could not thereby be used to describe, for example, Phase 2 data from the participants who followed the discrepant rule in the Albuquerque et al. (2003) study, for

in such study the programmed reinforcement contingencies were the same to Phases 1 and 2 from the same participant.

In a similar way, the definition suggesting that insensitivity describes lack of behavioral alteration after experimental manipulation (Madden et al., 1998) could also be only used to describe the behavior exposed to manipulations in the programmed contingencies and it therefore could not also be used to describe the Phase 1 and Phase 2 data of participants who followed the discrepant rule in Phase 2 of Experiment 2 from the Albuquerque et al. (2003) study. This is because in this experiment, after experimental manipulation (that is, after the introduction of discrepant rule in the beginning of Phase 2) the behavior changed (that is, participants stopped emitting behavior that had been reinforced in Phase 1 and started following discrepant rule in Phase 2) it cannot be classified as "sensitive" to the reinforcement contingencies, though. In other words, by Madden et al. (1998) definition, the behavior in Phase 2 should be classified as sensitive because it altered due to experimental manipulation. But, on the contrary, the experimental manipulation introduced in Phase 2 produced a clearly "insensitive" performance to the programmed contingencies (Albuquerque et al., 2008). That is to say, the introduction of discrepant rule produced a behavior according to the constituent justifications of this rule and therefore independent from its immediate consequences.

Hence, unlike the terms dependence and independence, the terms sensitivity and insensitivity are unnecessary for describing control by rules. When the behavior specified by a rule does not alter following changes in its immediate consequences; or when the behavior specified by a discrepant rule is maintained, maintenance of rule following in both cases occurs regardless of its immediate consequences. When the behavior specified by a correspondent rule is maintained, rule following maintenance occurs dependently of its immediate consequences, though. And when rule following stopped occurring, non-rule following may depend on its immediate consequences. In all cases the terms sensitivity and insensitivity are unnecessary in describing control by rules.

Future researches

Recently a set of related studies has begun investigating the competition between control by justifications, as stimuli constituent of rules, and control by immediate consequences, as stimuli constituent of reinforcement contingencies (Albuquerque et al., 2004; Castro, Paracampo, & Albuquerque, 2015; Gonçalves, Albuquerque, & Paracampo 2015; Najjar, Albuquerque, Ferreira, & Paracampo, 2014; Paracampo et al., 2013b).

For instance, Castro et al. (2015) investigated the effects of Type 1 justifications (reports on possible rule following consequences) and Type 2 (reports on possible acceptance or not to non-rule following) in maintaining the behavior specified by rule which produces programmed reinforcement (token) loss. Therefore ten children were exposed to a choice procedure according to the sample adapted from the one developed by Paracampo (1991). The task was to touch one of the two comparison stimuli in the presence of a contextual stimulus. Participants were distributed in two experimental conditions with five phases each. In Condition 1, Phase 1 was started with the correspondent rule. This rule contained a Type 1 justification indicating to the participant that the purpose of the game was to win lots of tokens and then buy toys at the store. Later, the researcher would say and show what the participant should do to earn a token. Then the following additional justifications were presented: a) Type 2: "*Some times in the game you may lose tokens, yet no matter what happens, if you are winning or losing tokens, you should always do what I said*", and b) Type 1:"*By doing so, you can shop at the white shop at the end of the game which has the toys you like the most*". Rule following produced token and non-rule following led to lose tokens. In Phase 2 no rule was presented and maintaining the rule following behavior produced the tokens' loss. In Phase 3, the return to the contingencies in force in Phase 1 occurred and the same rule presented in Phase 1 was presented again without the additional justifications of Types 2 and 1. In Phase 4, no rule was presented and the same Phase 2 contingencies were reestablished. In Phase 5, the return to the contingencies in force in Phase 3 occurred and the same rule presented in Phase 3 was presented again. Condition 2 was fulfilled with the purpose of controlling phase order effects in which additional justifications were presented. Thus Condition 2 was identical

to Condition 1 except for the fact that the additional justifications were presented in Phase 3 rather than Phase 1.

In Condition 1, all five participants stopped following the rule in Phases 2 and 4 when rule following started to produce token loss. In Condition 2, four out of five participants no longer followed the rule in Phases 2 and 4. One participant no longer followed the rule in Phase 2. Yet after the additional justifications in Phase 3 were introduced they followed the rule in Phase 4.

The results of Castro et al. (2015) and Paracampo et al. (2001) studies together support the suggestion that maintaining the rule following behavior depends in part on the kind of immediate consequence contacted by it. So rule following would be more likely to change by following alterations in programmed contingencies when it produced aversive consequences more than when it produced other kinds of immediate consequences (Baron & Galizio, 1983; Chase & Danforth, 1991; Galizio, 1979; LeFrancois et al., 1988; Paracampo & Albuquerque, 2004; Paracampo, Albuquerque, Farias, Carvalló, & Pinto, 2007; Paracampo, Albuquerque, & Farias, 2013a; Peron et al., 1988).

However, the performance from the only participant who, after being exposed to the additional justifications in Phase 3 followed the rule in Phase 4 deserves commentaries in order to conduct future researching. It is possible that the performance of this rule follower participant was more in control of the Type 2 justification while the other nine participants' performances were more under control of Type 1 justifications. Thus after contingency alterations, the participant in examination may have followed the rule because Type 2 justification had specified that he should always do what the speaker said to be done regardless of what happened in the game, independently on whether the participant was winning or losing tokens. All the other participants may have stopped following the rule because the immediate consequences produced by rule following were discrepant with Type 1 justification, which promised that if the participant did what was described they would win tokens and could buy the favorite toys and if they did not do what were described they could only buy the least favorite toys. Such assumptions could be tested in future researches seeking to compare the effects of Types 1 and 2 justifications. Such researches are relevant for they can

contribute to the boundaries establishment amongst what should be attributed to justifications functions, such as stimuli constituent of rules, and amongst what should be attributed to the immediate consequences functions, as stimuli constituent of reinforcement contingencies (Albuquerque et al., 2013; Albuquerque & Paracampo, in press).

Final Reflections

The analysis made in this study suggests that the main variables that may favor or prevent behavior established by rule and the behavior established by reinforcement contingencies in a certain specific situation are: 1) types of justifications (Types 1, 2, 3, 4 and 5) to rule following and non-following (Albuquerque et al., 2013; Albuquerque et al., 2014; Albuquerque & Paracampo, in press); 2) types of immediate consequences (punishment, positive reinforcement, negative reinforcement, extinction) produced by rule following and non-following (Galizio, 1979; Paracampo et al., 2007); 3) types of schedules (continuous or intermittent) programmed to reinforce behavior specified by rule and the alternative behavior to the one specified by rule (Newman et al., 1995); and, (4) histories of the listener, such as: a) history of control due to differential immediate consequences; b) history of control by differential justification; and c) history of control through the interaction between immediate consequences and justifications to rule following and non-following (Albuquerque & Paracampo, in press). Therefore the established behavior by rule or the behavior established by its immediate consequences maintenance depends more on the combination between the set of favorable conditions and the set of unfavorable conditions to its maintenance than on one or another condition alone (Albuquerque et al., 2003; Albuquerque et al., 2013).

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7 Laws and the Complex Control of Behavior[1]

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Abstract

Laws are written to control behavior. Sometimes the control occurs immediately after its approval by Congress and the sanction of the Presidency. Sometimes the actual control is partial: only a part of the country obeys the law, or only a class of citizens, or the enforcement is slow in being established. The analysis of laws as metacontingencies, as sets of interlocked individual contingencies, helps in the study of how, when, and why laws control behavior. Data from individual cases of adolescents in Brasilia who were penalized according to the Statute of Children and Adolescents (Estatuto da Criança e do Adolescente – ECA) were analyzed to show how the concept of metacontingency helps to understand flaws in the law and flaws in the application of the law.

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Laws are written to control behavior. In a perfectly democratic society where *the due process of law* is more than just verbal behavior, laws are the codification of the controlling procedures of governmental agencies (Skinner, 1953). In behavior analytic terms, control is not synonymous with coercion, but quite often we think of laws as implying aversive control. Laws also prescribe positive consequences for desirable behavior, as in tax exemptions, or negative income tax for parents who keep their kids in school. But what is a law? In *Science and Human Behavior* (1953), Skinner addresses the issue in Chapter XXII (Government and Law): what is the role of law in government control and what is the effect on behavior of the people and of persons in the controlling agency?

> **A law is thus a statement of a *contingency of reinforcement maintained by a governmental agency*. The contingency may have prevailed as a controlling practice prior to its codification as a law, or it may represent a new practice which goes into effect with the passage of the law. Laws are thus both descriptions of past practices and assurances of similar practices in the future.** (Skinner, 1953, p. 339).

In most of the examples used by Skinner coercion is involved, and behavior is defined by its consequences, not its topography. But how does a law come to control behavior? Ignorance of the law is not an excuse; once in effect it is up to each person to know it and *behave*, in the everyday language sense of it. Family, the ethical group, educational and religious institutions, the media, are in charge of teaching what is wrong and what is right under the law. The controlling agencies usually take no steps to advertise the contingencies of aversive control that are in their power to enforce; those involving positive reinforcement, on the other hand, usually receive special attention. In Brazil state governments are nowadays involved in a fierce competition to attract new business, offering tax exemptions. Their marketing techniques are superb.

Laws usually involve complex behavior. Complex in the sense that their articles describe more than single responses, specify applicable circumstances, and sometimes point out attenuating conditions. Legal control involves a web of laws; a single unlawful act puts in motion an entire apparatus.

> **How codes of law affect governmental agents is the principal subject of jurisprudence. The behavioral processes are complex, although presumably not novel. In order to maintain or 'enforce' contingencies of governmental control, an agency must establish the fact that an individual has behaved illegally and must interpret a code to determine the punishment. It must then carry out the punishment. These labors are usually divided among special subdivisions of the agency. The advantages gained when the individual is 'not under man but under law' have usually been obvious, and the great codifiers of law occupy places of honor in the history of civilization. Codification does not, however, change the essential nature of governmental action nor remedy all its effects.** (Skinner, 1953, p. 341).

A single unlawful act may represent the beginning of a behavioral chain involving dozens of agents over months or years. How can a society ensure that a new law, approved with the intention of promoting changes in cultural practices, will control new behavior of citizens and of government agents alike?

From a behavioral point of view, laws are constituted of three-term contingencies, interlocked into metacontingencies (Glenn, 1986; 1988; 1991; Todorov, 1987; Todorov & Moreira, 2004). Thus, one way of looking at how a law controls behavior is to begin with the analysis of the law as a written statement of interlocked contingencies that control individual behavior. Todorov, Moreira, Prudêncio, & Pereira (2004) studied the Brazilian law for the protection of children and adolescents. The general objective of the law is clear: to guarantee conditions for

the healthy development of children and adolescents. It can be seen as a set of metacontingencies (complete or not, well described or not). Article 7 opens the section on the protection of life and health:

"Children and adolescents have the right to protection, to life and to health through a public social policy that allows birth and healthy and harmonious development, in dignified conditions of living."

Two hundred and sixty seven (267) articles of the law were examined in order to see how general objectives like those stated in Article 7 were related to articles which specified antecedents, behavior, and consequences (i.e., full statements of the contingencies involved). An article may deal with behavior of a child, a teenager, policemen, district attorneys, judges, nurses, physicians, teachers, or anyone else. Children and youth never are described with terms that the judiciary system uses with adults. A child never is a criminal; he may be in conflict with the law. He will never be sent to prison; at most a judge will prescribe some time at a public establishment destined for socio-educational rehabilitation (prisons for children, actually, in some cases, but it is politically incorrect to say that).

A first result of that analysis was the finding that the sequence of articles in the law is not organized based on contingencies and metacontingencies. A contingency may have its antecedents described in an article that follows another describing consequences for behavior specified in another place. Surprisingly, however, almost half of the articles included three-term contingencies. Another third were made of statements of behavior and consequences. Some included descriptions of antecedents and behavior, but no clear consequences. Other articles were just general statements about what is desirable.

The articles in the law are divided by themes, ranging from Health, Freedom, and Family, to Procedures and Resources. The analysis showed that articles on themes like *Health and Prevention* tended to be complete, that is, they specified antecedents, behavior, and consequences. Under *Prevention* are articles destined to

protect the young people from exposure to movies with sexual content or drugs, including alcohol. *Health* includes articles describing in detail the rights of children to medical assistance, including hospitalization, from conception to adulthood. Other themes well covered from the behavioral analysis point of view are Family, Education, Sports, Infringement Act, Freedom, and Guardianship. Those including incomplete contingencies (contingencies with only one or two terms of a three-term contingency) include Professional Training, Protection Measures, Judge, Auxiliary Services, Procedures, Infringement of Administrative Rules, District Attorney, Lawyer, and Protection of Rights.

The law is better written when it deals with undesirable behavior of adolescents and the desirable behavior of governmental agents when dealing with that undesirable behavior. With other issues, however, the law is not clear. Who will have custody of a child caught infringing the law? This depends on a personal decision of the judge, helped by advice from psychologists and social workers, for instance (when the State provides those services in that locality).

An incomplete contingency opens the possibility of different interpretations, and sometimes to inaction. Article 4 of the law specifies that it is the duty of the family, of the local community, of society in general and of the government to assure the rights of children to food and health, without specification of consequences. As a means for controlling behavior, this statement is of no value.

The analysis of the ECA as a metacontingency began with an undergraduate research grant from CNPq (Brazil) to Maísa Moreira, under the supervision of J. C. Todorov. Mara Regina A. Prudêncio and Gisele Carneiro Campos Pereira are psychologists working with the judge of the court of children and adolescents of Brasília, and students in the Master's Program at the University of Brasília, also under the supervision of J. C. Todorov. Mara Prudêncio and Gisele Campos studied the records of actual cases of adolescents in conflict with the law, analyzing each step of the process according to the contingencies specified in the law. Preliminary results show clearly why laws should be clear, detailed, and specific. Practically every time a

judge can choose freely between two possible contingencies, one specifying consequences for those governmental agents who do not act as the law prescribes, the other described in general and almost fuzzy terms, this second alternative is chosen. In almost every case the process is finished and archived without the acts of judges, district attorneys, policemen, teachers, technicians, occurring as the law prescribes. The following is an example:

Procrastination

A girl committed attempted murder at the age of 15. The judge decided to send her to a socio-educational institution for rehabilitation, but she never went there. She was called to the office of the public attorney to explain why she was not going to school. She argued that she was taking care of her newborn baby and besides that she didn't have the money for the bus ticket. She was then required to attend a second institution, but never appeared there. She was called a third time, and was referred this time to a third institution and provided with a free bus ticket, but again never went. An audience was marked for the girl to be admonished by the judge, but she didn't appear. The judge decided that she should be brought to the court under coercion, but that never happened. Some days later she went to the court on her own initiative, to say that she had given birth to a second child. She was admonished and sent to a fourth institution, but again never went there. Given that by then she was much older, the time in a socio-educational institution was changed into a fine. All attempts to get in contact with the girl so she would pay the "donation" failed. In February of 2005 she had her 21st birthday, and the process under the ECA was considered extinct. In the six-year period she committed four minor infringements, three physical assaults, and as an adult, a felony.

Who cares?

A teenager in conflict with the law is seen as a person in a peculiar condition of development, needing special protective measures. Article 101 of the Statute dictates conditions for protective measures, but there are no consequences for the agents in charge when nothing happens. In the work being developed by Gisele Pereira, involving 100 cases recorded in the year 2002, in 11 the judge decide in favor of protective measures. In all 11 cases nothing happened. After varying periods of time, ten processes were archived without any additional decision by the judge, manifestation by the public attorney, or by any other person. The case was simply closed. In the single exception, a technical officer reported that the teenager did not require protective measures.

A socio-educational measure, a contingency described in Article 112, could be the decision of the judge. In such case, punishment for the agent who fails to act in accordance with the article is included. The teenager should be in school and psychologists and social workers should follow his development and give assistance to the family. But that, it seems, will imply much more work for the judge, the attorney, and policemen. So, no behavior occurs.

The Judiciary as a cultural system

Glenn (1993) once described ABA, the Association for Behavior Analysis International, as a cultural system. Likewise one can see the Judiciary System of a country as a cultural system, or as a subsystem of a larger international cultural system comprised of all those national systems influenced by the ancient Greeks and Romans. From the behavioral point of view, a Judiciary system exists in the interlocking behavioral contingencies that define its particular cultural practices. The Judiciary system is composed of physical and organizational structures, and of its members, judges, lawyers, attorneys, and the like. But as a cultural system, the Judiciary is entirely dependent on the behavioral repertoires of its members. When a

new law just describes ongoing cultural practices in a certain community, enforcement of the law does not conflict with the behavioral repertoires of the governmental agents in charge of that enforcement. But in a different region of the same country, that new law is a technological metacontingency (Glenn, 1986). Changes in cultural practices of the community will certainly be slowed by the necessity of prior changes in the behavioral repertoires of those who are to enforce the law.

In a national judiciary system that is already slow, if not archaic, decision making by judges and attorneys sometimes follows the line of least effort. Police brutality, even with children, is seen in some parts of the country as a necessary educational measure; some mothers approve the beating of their adolescent sons because that is what they would like to do but are not strong enough to face the young man. In other cases the protection measures determined by the law are costly in terms of resources and manpower, so nothing happens. Thus, for a technological metacontingency to produce new cultural practices, other agencies besides the judiciary must act, like the educational system and nowadays the media, especially television, with society as a whole acting as external control of governmental agencies.

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