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Case Study

Functional Communication Training for Autism: An Italian Case Study

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Abstract

Challenging behaviours represent a common issue amongst people with Autism Spectrum Disorders (ASD). As a result, such behaviours can significantly interfere with learning processes and both the individual and their caregiver's quality of life. To implement a procedure that eliminates or reduces CB, a wide range of techniques can be utilised. Although there seems to be consensus regarding the need to reduce and eliminate CB, it is nonetheless important to implement an intervention which replaces the target behaviour with a socially acceptable alternative behavior through reinforcement. The present study has been realised with the intention of replicating a Functional Communication Training procedure (FCT; [1]). In practice, the intention was to apply the procedure to a four-year old boy with autism, with the aim of reducing CB, improving his relationship with his caregivers and increasing compliance times with the adult's requests. The results demonstrate a significant reduction of CB, an improvement in functional communication, and a gradual improvement of compliance time.

Keywords: Applied Behavior Analysis; Autism Spectrum Disorders; Challenging Behaviors; Functional Communication

Theoretical and Research Basis for Treatment

People with ASD frequently display what are termed 'Challenging Behaviours' (CBs). Indeed, such behaviours are seen as challenging both for those who enact them and for those present in their surrounding environment. Moreover, CBs often engender severe limitations in the individual's learning capacities, while such behaviours may also be perceived as socially unacceptable or even as potentially dangerous. Examples of such behaviours include Self-Injurious Behaviour (SIB), aggressiveness towards others, destruction to surrounding environments, stimming, non-contextual vocalisations [2], sleep disturbances, [3,4] and inappropriate sexual behaviours [5].

To implement a procedure which eliminates or reduces CBs, a wide range of techniques can be utilised. Previous examples include punitive procedures such as time-out [6]; response-cost [7]; overcorrection [8] and use of contingent electric shock [9,10]. However, procedures based exclusively on extinction and punishment contain several inherent limitations.

For instance, such approaches often engender undesired collateral effects such as a temporary increase in the frequency, duration or intensity of the target behaviour, or an increase in the likelihood of "escape" behaviours, such as aggression or avoidance, in response to the punishment. Furthermore, such interventions lack any significant educational value, as they fail to teach appropriate

behaviours which can replace problematic behaviours.

Moreover, interventions based solely on punishment and extinction raise important ethical and legal issues [11,13]. In particular, the Professional and Ethical Code for Behavioural Analysts recommends the use of reinforcement over punishment wherever possible, highlighting that minimally restrictive procedures are equally effective as those which are more restrictive.

Carr and Durand 1985 [14] conducted an important study that aimed at identifying situations in which one can most accurately verify the onset of CBs, as well as the most frequently used and effective types of replacement to CBs. In this original and novel study, the authors initially noted that CBs can be replaced by socially acceptable behaviours, particularly through the encouragement of functional communication. As such, they hypothesised that some CBs might represent a dysfunctional way in which subjects with reduced communicative skills express their requests and needs. Accordingly, both CBs and normative communicative acts perform identical functions, albeit with very different manifestations. This hypothesis was supported by subsequent investigations by [15-17], and [18], who conducted a functional analysis for the purpose of identifying the communicative function (or intent) of a challenging behaviour. In a sistematic replication of a functional analysis, [19] showed the relations between mands and CBs. CBs could conversely be conceptualised as "learning behaviours", as they can be operationalised to receive attention, obtain an object or escape a task. The frequency of these behaviours then increases, as they often evoke positive reinforcement and result in the satisfaction of the subject's needs. Fisher, Adelinis, Thompson, Worsdell, and Zarcone 1998 [20] observed that the adult's interference with the subjects' preferred activities represents the main antecedent for the onset of CBs in children with disabilities. CBs are most likely to occur when a child engaging in a pleasant activity is stopped or denied by being told: "do not", or when a child is encouraged to do a new activity by being told, "do something else". These CBs are then maintained through positive reinforcement (the child gets to return to the preferred activity), which can be replaced by extinction-based functional communication training. Although there seems to be a general consensus regarding the importance of reducing and eliminating CBs, it is nonetheless important to implement an intervention which replaces the target behaviour with socially acceptable alternatives by way of reinforcement. This type of reinforcement is known as 'differential reinforcement' because it selectively provides reinforcement only for the desired response and extinction to all the unwanted responses [11].

Functional Communication Training (FCT) is described as a Differential Reinforcement of Alternative Behaviour (DRA) procedure. In this procedure, the individual is taught an appropriate behaviour while the problematic behaviour is placed on extinction. This procedure is inserted alongside the antecedent-based intervention, coupled with the non-contingent reinforcement and the high-probability requests. According to Tiger, Hanley, and Bruzek 2008 [21], FCT interventions consist of three phases. Firstly, a functional analysis is conducted in order to determine the conditions that evoke and maintain the initial problematic behaviour. Secondly, a socially acceptable communicative response is proposed. This response is characterised as having the same function of the original CB, accounting for the effort required to perform the Functional Communicative Response (FCR), along with the strategies necessary for teaching and its social acceptability.

Finally, the outcome of the intervention is then generalised across other settings and among other care-givers. In the relevant literature, FCT procedures have largely been associated with other types of intervention which likewise aim at the reduction of CB. For instance, FCT procedures have been combined with extinction [14,22], with punishment [23,24], with differential reinforcement of others behaviors (DRO) [25], with differential positive reinforcement [26], with delayed-reinforcement tolerance training [27], with alternative reinforcers to facilitate tolerance to delayed reinforcement [28], and with non-contingent reinforcement [29].

There are several elements to keep in mind when implementing a FCT based program, as delay reinforcement or thinning reinforcement schedules. The effects of a delay to reinforcement on the variability of communication responses [30] and prevalence of resurgence of destructive behavior when thinning reinforcement schedules during functional communication training were also evaluated [31].

However, Geiger, Carr and LeBlanc 2010 [32] have expressed concerns regarding the limitations of procedures based upon FCT. In particular, the authors highlight high rates of communicative responses from the child, even when such responses are unnecessary, and negative effects (such as self-stimulation) when the instructions are not delivered. A study from Hanley, Jin, Vanselow, and Hanratty 2014 [1] applied a protocol that combined FCT with extinction. Subsequent to the treatment, the authors observed a number of positive outcomes in children with autism. Namely, a reduction in CBs, a gradual increase in reinforcement delay and denial tolerance, and an increase in compliance with the adult's instruction. The first objective of this procedure is teaching a replacement behaviour in the form of a simple FCR. Subsequently, the complexity of the FCR is increased by teaching attention seeking strategies. Once the previous steps are accomplished, delays and/or denials ("No" responses by the adult) are introduced, followed by teaching the child a tolerance response (TR) to the denial. Once the child acquires an FCR and an adequate level of denial tolerance, he or she must respond appropriately to simple instructions during compliance training and reinforcement

delay training. Subsequently, the child should become increasingly capable of displaying complex responses during the compliance time and reinforcement delay training procedures. Finally, the procedure should then be extended to other ecologically-relevant situations for the child.

In accordance with the aforementioned intervention protocol, the present study intends to modify CBs in a child with autism. It aims at extinguishing and replacing the child's dysfunctional behaviours with functional communications through an FCT intervention combined with extinction. This procedure has been conducted in the form of a changing criterion experimental design.

Case Introduction

The participant is a child with autism, Nathy, whose diagnosis was provided by an external team of child neuropsychiatrists through the following assessments: Autism Diagnostic Observation Schedule-Generic [33], Autism Diagnostic Interview-Revised [34] and Griffiths Mental Developmental Scale-Extend Revised [35]. When the FCT procedure was first initiated, Nathy was four years and five months old and had previously been subject to the Applied Behaviour Analysis (ABA) approach for two years. The therapeutic procedure was structured into 40 hours per month, with 4 hours of therapy per day, Monday to Friday, on alternating weeks. The individualised educational plan conducted at the clinic was supervised for 20% of the overall time by an experienced case manager.

The therapist who treated Nathy at the clinic held a master's degree in ABA and a specialization in psychotherapy. In addition, two private therapists shadowed the child in the community for approximately 30 hours per month. The intervention was augmented by providing parental training to the mother. Her training consisted of approximately 20 hours of lessons in verbal behavioural analysis and the management of problem behaviours. Furthermore, each week she had the opportunity to observe the therapy conducted at the centre. In particular, her training focused on performing specific objectives to be generalised and integrated, both at the centre and at home. Prior to the introduction of the FCT procedure, the child's educational program included training in cognitive and communication skills. Specifically, Discrete Trial Teaching (DTT) and Natural Environmental Teaching (NET), the combination of which are recognized as an effective teaching strategy [36]. The educational objectives for this procedure included imitation (of actions), the articulation and pronunciation of selected words (with the collaboration of a speech therapist as consultant), correct labelling of objects and actions, matching-to-sample tasks and demonstrable comprehension of adjectives. With regard to social-skills training, Nathy developed turn-taking abilities during play activities, vocal requests using two-word sentences (verb and object), appropriate requests for attention and achieving eye contact in response to hearing his name called.

Presenting Complaints

Before starting the current treatment program, Nathy's CBs were identified through direct observations at the centre and interviews conducted with the family and school therapists. For example, Nathy would scream and cry while collapsing onto the ground, kicking towards objects and people in the form of temper tantrums. The duration of these tantrums varied between 15 to 50 minutes. Generally, such behaviours occur whenever the operator or parent proposes a transition in the child's engagement, such as a transition from one room to another, or from one reinforcer object to another. For example, Nathy's parents would typically report "a daily struggle", since it was frequently necessary to interrupt regular activities or remove certain objects in order to "do something else".

Such activities included departing the family home, leaving the tablet at home or replacing it with another game, following an adult's instruction, getting out of a swimming pool or leaving the gym at the appropriate time, etc.

History

Nathy was raised by his biological parents, and is the youngest of three children, residing in an average socioeconomic area. However, the city in which they live was underserved with respect to the provision of public or private behavioural interventions. As a result, the child followed the treatment in another region, effecting the schedule of the intervention. Additionally, Nathy grew up participating in sporting activities such as rugby, which served as important motivational and social activities. The behavioural therapists reported that his mother was supportive but authoritative in providing discipline and structure, while his teachers showed some difficulties in maintaining the instructions provided in treating the child, increasing the frequency of defiant/challenging behaviours. For this reason, the child was often absent from school (e.g., the staff reported that his mother suggested both staying at home and skipping school/work if Nathy showed severe behaviours in daily living situations). In spite of their frequent travelling, Nathy's parents did not display any lack of "normal" family care, since they received support from the grandmother who lived in the city in which the children attended the intervention. Nevertheless, Nathy's mother stayed only for a few days of the week with the rest of the family.

Assessment

Even though we did not perform an experimental functional analysis of the CBs, a descriptive analysis of the data from Antecedents, Behaviours, Consequences (ABC; narrative recording) was gathered, and previous investigations have indicated their functional nature. In particular, the interviews with Functional Analysis Screening Tools [37] and the Interview-

Informed, Synthesized Contingency Analyses [12,38-42], suggest that such behaviours generally occurred whenever someone stopped or removed a pleasure activity or not permitting a desirable object/action required. Likewise, the child tried to avoid unpleased instructions provided by other people.

Case Conceptualization

After having conducted direct observations, interviews and descriptive analysis, we were able to formulate a hypothesis regarding the functional role of CBs: as a strategy enacted by the child to access desirable items or as a diversion from following the adult's instructions. As such, the former (access to items) is sustained through positive reinforcement (the child obtaining access to the item), while the latter is maintained by negative reinforcement (the child not having to comply with the adult's requests).

Research design

The study we conducted employed an experimental design with a changing criterion design. Phase A represents the baseline built upon the groundwork of descriptive data acquired during the prior descriptive assessment. For phase B, the criteria featured first the simple FCR, then the complex FCR. Subsequently, the criterion shifts to a tolerance and compliance response.

Setting and Instruments

As previously highlighted, the initial phases of the training were conducted entirely at the clinic, using all the available areas: the therapy room, playroom, gym and outdoor playground. All of the relevant materials present were used as both reinforcers and as elements for obtaining compliance. In the final phase of generalisation, the settings became considerably varied, ranging from the playground to nearby locations such as the shopping centre, main road and local museum, utilising materials that were available in their natural settings. A pen was used to record data, and a data sheet and a timer were used to record the time duration of compliance and access to the reinforcement.

Data recording

During the generalization sessions that were implemented by Nathy's mother, data were collected only in relation to the frequency of CB. Conversely, during the sessions held at the clinic, both the frequency and intensity of problem behaviours were quantified and collected through a continuous data collection. The intensity of the problematic behaviour could vary in range from 1 to 3. 'Level 1' represented the lowest intensity, characterized by a slight moaning and by avoidance behaviour (e.g. Nathy moving his hands away, keeping them crossed, etc.). '2' represented medium-intensity behaviour, characterized by screams and crying. '3' represented the highest intensity; at this level, the subject engages in aggressive actions, such as kicks and slaps to the therapist, or damage to the surrounding environment. Simultaneously, we recorded the frequency of autonomous functional communication responses; that is, the correct FCRs and the duration of the compliance (in seconds and then minutes).

The data collection featured a continuous data recording and reported the precise sequence in which the various phases of the intervention were implemented. The exact number of seconds and minutes spent in compliance were recorded. In the event of CB during the compliance training, the timer was reset and restarted. Therefore, the timer was restarted in those cases in which Nathy began to collaborate after the therapist instruction. Additionally, the access time to the reinforcement in each trial was highlighted.

Course of Treatment and Assessment of Progress

The treatment program that we followed consisted of three phases. In the first phase, we taught Nathy a simple FCR as a substitute for CB. Nathy learned to say "I" by touching his chest with his right hand every time his reinforcer was removed, and a new activity was proposed, or a change into another room was announced. Nathy's FCR was reinforced continuously for an average of 30 seconds throughout the different trials, randomly. During the second phase, we increased both the FCR's complexity and appropriateness. After Nathy learned to request attention by referring to the therapist by name, he then learned to wait for a response before introducing the simple previously acquired FCR, the assertion of: "I".

After completing the first two phases, we introduced delays and denials by teaching Nathy a tolerance response in reaction to the "no" response from the adult. In order to do so, both vocal and gestural specific discriminative stimulus (SD) were used throughout prompt fading: the operator visibly shook their head while saying: "that cannot be done/it is not possible" in response to Nathy's "I". Nathy was taught to respond to this denial with "ok", combining a gesture (opening his arms with palms facing upward) with a vocalisation. The percentages of requested performances after having acquired the tolerance response were as follows: 40% between the first and second phase and 60% in the third. Gradually, the operator's gestural stimulus was faded until completely disappearing, and "no" was replaced by another SD with the same meaning, such as "I am sorry, but now you cannot", "It is definitely not possible", "look, we have to do something else". At this stage in the procedure, we taught Nathy a series of simple answers. In 60% of the trials, we began to include compliance to the instructions, consisting of simple activities lasting 5, 10 and 15 seconds. For the remaining 40% of trials, the FCR was reinforced by stopping at the first three phases. Subsequently, more difficult answers were expected. The increased degree of difficulty regarding the compliance concerned not only the length, but also the difficulty of the required task. Therefore, we divided the performance itself into three different levels, introducing those requests for which Nathy

had previously showed CB in the interval lasting shorter time (such as tidying up games, leaving the room to search for an object placed outside, putting his shoes on to exit the gym). Conversely, in the longer time intervals, we introduced procedures in which Nathy had always experienced success, and mainly concerned the area of teachings in DTT.

The seconds spent in compliance and the type of tasks required gradually increased in both time and complexity, up to the inclusion of sessions lasting 1, 4, 8, 10 and 15 minutes. These sessions included both educational tasks (imitation, listener, tact, echoic) and collaboration and compliance in daily behaviours (holding hands and walking together, exiting the room, putting his jacket on). Before proceeding with the generalization process, the percentage of the collaboration time should be balanced at 50%, with a balance struck between working-time and access-time to reinforcements.

The last phase aimed to generalise the intervention to other contexts. Thus, the generalization program was implemented in environments other than the clinic and involved Nathy's mother and the clinicians at home and at school. Although Hanley et al. 2014 [1] implemented this phase at the end of the intervention, we decided to begin the generalization process with the mother immediately subsequent to Nathy acquiring the tolerance response. This strategy enabled Nathy to retain and apply the skills he acquired at the clinic during the week and outside the clinic.

Once the entire procedure had been completed at the centre, school and home environments, additional sessions designed to generalize these skills were prepared and employed in public places, such as shops and supermarkets. During these generalisation sessions, we used predominantly social reinforcements, which were confirmed to be effective. This intervention, which consisted of 48 sessions of 4 hours duration for approximately five months, led to a drastic decline in the frequency and intensity of CB. Specifically, the frequency declined from an average of 6 in baseline to 0.3 during the sessions that comprised the intervention. These data demonstrate how, in comparison to the beginning of the intervention, CBs decreased substantially in both frequency and intensity.

At the beginning of the third phase of the tolerance response and compliance training, some CBs did re-emerge, though of low intensity. These CBs occurred after Nathy had received his first requests, and subsequent to the introduction of delays in reinforcer delivery. However, Nathy never reached Level 3, and the first requests, along with the introduction of compliance, only ever reached level 2. Subsequently, CB decreased primarily to low intensity, then, finally, to 0. Moreover, the time spent in compliance showed significant changes, extending from a maximum of 40 minutes per session in the baseline to 120 minutes in the last recorded session. Therefore, it was observed that the time spent in compliance had tripled. For more information, please refer to (Figure 1 and 2).

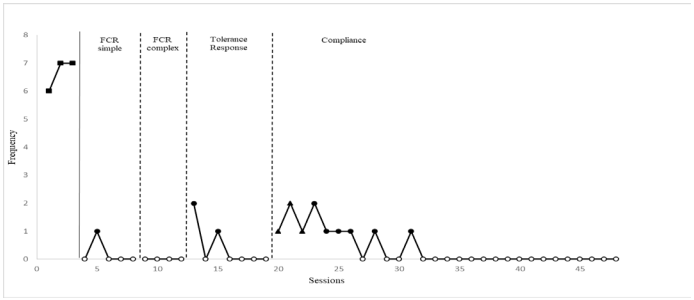

Figure 1: Frequency and intensity of challenging behaviors.

Note: The different symbols represent three levels of the behavior's intensity including: white circle=0 (no CB); black circle=1 (the lowest intensity of CB like a slight moaning); black triangle=2 (medium intensity of CB like screams and cries) and finally black square=3 (the highest intensity of CB like screams, cries, kicks, slaps, punches to the therapist and destruction of objects).

Through the FCT procedure and the gradual insertion of requests from the adult, Nathy significantly increased the duration in which he could engage with educational planning and cooperate in daily activities (exiting the car, putting on shoes, moving from one place to another, etc.).

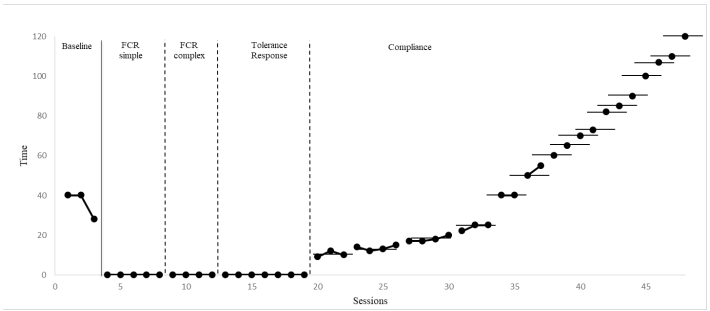

Figure 2: The graph shows the compliance time of the child in minutes during the sessions of therapy.

Note: The short horizontal lines represent the acquisition criterion in minutes planned by supervisor during therapy sessions in order to extend the compliance time of the child to instructions

As displayed in (Figure 2), during the first phases of the intervention (first, second and third) no compliance was required, except for a few seconds of communicative exchange in order to perform the FCR.

However, throughout these phases, the therapist was particularly careful to lengthen their response times so as not to give reinforcement immediately after the "I" or "ok", so small pauses could be inserted. Naturally, while advancing through the phases of

the procedure, the compliance times lengthened considerably. This highlighted a trend of sharp increase, up to a perfect equilibrium between working-time and access-time to reinforcement. Initially, the criterion for increasing compliance times consisted of two consecutive therapy sessions in which Nathy had to be able to complete the planned duration of compliance, with no incidences of CB during the instruction. However, from the thirty-eighth session onwards, the criterion was reduced to a single session because instances of CB had ceased completely.

Complicating Factors

In implementing this intervention, we faced several difficulties, which are useful to consider for the purposes of future training for other specialists. For instance, the inclusion of "No" referred not only to reinforcement delays but also to categorical denials (such as climbing on furniture, bringing the tablet to school).

However, with the increase of the time required to obtain simple and complex answers, compliance in general improved, even external to the procedure. Hence, it was easier to manage these occurrences. Moreover, Nathy's mother reported that most people who engaged with Nathy lacked any specialised training, although they were informed of the basics of the procedure. As a result, the child was exposed several times to an inconsistency in the answers from the environment, as not all of those who interacted with the child or were aware of, or able to, respond appropriately in line with the FCR framework. In contrast to Hanley et al. 2014 [1], a marked improvement was not evident in all contexts, but the FCT did produce a reduction in CBs in a protected environment. Moreover, in accordance with the work of Geiger et al. 2010 [32], a high rate of self-stimulation was detected, especially during the early stages of the intervention, when educational tasks were essentially absent. In comparison with the standard procedure that provided exclusively social reinforcement within compliance intervals, in the current intervention it was difficult to provide instructions for long periods of time (e.g. fifteen minutes) without tangible reinforcement.

Likewise, a number of limitations were recognized in this study. Firstly, we did not perform an experimental functional analysis to confirm our hypothesis regarding the function of CBs. Furthermore, there is currently a lack of supporting data to cross-validate some of our clinical observations. For example, it was noted that the absence of CBs led Nathy to improve his experience at the centre and to seek the therapist more often and involve him in shared activities. However, there are currently no corroborating data to support this observation. Nonetheless, it is interesting to underline that, currently, most of the access-time to reinforcements consisted of games directly including the therapist, such as hide and seek, running, cycling and similar activities.

Access and Barriers to Care

Additionally, a further limitation of the study was the fact that Nathy's mother was involved since the beginning of the procedure. Indeed, this certainly led to a decrease in time spent in direct intervention with the child, and as a result, this influenced the process of acquiring the various FCRs. Furthermore, the current lack of data concerning the generalization phase renders the study partially incomplete. Moreover, the intervention was implemented at the clinic on alternating weeks since the child's family lived in another region and for the lack of expertise in the same community, potentially implying a lack of adherence to the procedures at home. Currently, the manager of the school attended by the child has planned a behavioural training course for the teachers in order to reduce the gap of expertise in the community. Likewise, the family in according with clinicians is planning a training course for local professionals.

Follow-up

Although we have no follow-up information regarding the first stages of the intervention, Nathy is currently following the same procedure as described above. Furthermore, Nathy is showing a lower rate of CBs at the centre and while staying with his mother, rather than at his school. These results are supportive of our previous data which show that, in the absence of appropriate training, the interaction between others and the child could lead to the reinforcement of challenging behaviours.

Treatment Implications of the Case

Despite these limitations, the present study supports previous research that encourages the management of CBs through techniques based on reinforcement in contrast to punishment, and that favours minimally restrictive but effective interventions through teaching functional communications. Interpreted in this way, these results further support an approach to behavioural therapy which successfully ameliorates the quality of life of both children with autism and their families. The purpose of this study was to implement an intervention based on FCT and extinction to replace CBs with functional communications in a child with autism, and to increase compliance times with the adult's requests. The results of this study show a decrease in CBs and an increase in compliance times, in accordance with Hanley et al. 2014 [1], and offer further support to the hypothesis that CBs can be replaced by functional and socially acceptable communications [14,21]. Indeed, the employment of an intervention that is minimally restrictive, yet demonstrably effective - utilising reinforcement instead of punishment - allowed us to enable positive communicative interactions between the child and caregivers whilst minimising problem behaviours. Likewise, the absence of CBs allowed us to spend greater time in curricular planning for the child's education.

Recommendations to Clinicians and Students

For future research, it may prove fruitful to gather data on the changes in the relationship between child and therapist, comparing the frequency and quality of shared play activities. Additionally, new generalisation strategies could be implemented in order to facilitate communication in community settings, especially for those untrained in the procedure.

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