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Token system as an intervention used for reducing hyperactivity in children with ADHD

System żetonowy jako interwencja terapeutyczna ukierunkowana na redukcję nadpobudliwości u dzieci z ADHD

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Summary

The aim of the experiment was to study the effects of a token system on the level of hyperactivity in three children age 8-9 years, diagnosed with the Attention Deficit Hyperactivity Disorder (ADHD). The study was conducted at the boys' homes and also at the schools they attended. During individual home sessions – while the children were doing their homework – levels of three main ADHD symptoms: hyperactivity, inattention and impulsiveness were measured. The independent variable consisted of two elements: the introduction of “good behavior” rules and awarding tokens for following the established rules. The study made use of the single-subject reversal design. Following baseline, intervention took place during four consecutive sessions, then return to baseline, and finally intervention was reintroduced. The obtained results demonstrated the effectiveness of the administered intervention in all participants – the level of hyperactivity was decreasing while the token system was used. Additionally, the experimenters measured the degree of generalization of the treatment effects to the other ADHD symptoms, and also to the other environment (i.e. the school). The results show no generalization across behaviors and settings.

Key words: ADHD, token economy, hyperactivity, rules, reinforcement

Streszczenie

Celem przeprowadzonego eksperymentu było zbadanie efektów wprowadzenia systemu żetonowego na poziom nadpobudliwości u trójki dzieci w wieku 8-9 lat ze zdiagnozowanym zespołem nadpobudliwości psychoruchowej (ADHD). Badanie przeprowadzono w domach chłopców, a także w szkołach, do których oni uczęszczali. W trakcie indywidualnych sesji domowych – podczas odrabiania lekcji – mierzono poziom trzech głównych objawów ADHD: nadpobudliwości, braku uwagi oraz impulsywności. Zmienna niezależna składała się z dwóch elementów: wprowadzenie reguł poprawnego postępowania i przyznawanie żetonów za stosowanie się do ustalonych reguł. W badaniu wykorzystano jednopodmiotowy schemat eksperymentalny z powrotem do stanu początkowego. Po sesjach pomiaru stanu wyjściowego (*baseline*) przez kolejne cztery sesje następowała interwencja, po niej powrót do stanu wyjściowego, a na koniec znowu wdrażano interwencję. Uzyskane wyniki wskazywały na skuteczność zastosowanych oddziaływań u wszystkich uczestników badania – poziom nadpobudliwości malał w sytuacji stosowania systemu żetonowego. Dodatkowo podjęto się zmierzenia stopnia generalizacji oddziaływań na pozostałe objawy ADHD, a także na inne środowisko (tj. szkołę). Wyniki wskazują na brak generalizacji.

Słowa kluczowe: ADHD, gospodarka żetonowa, system żetonowy, nadpobudliwość psychoruchowa, reguły, wzmacnianie

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a diagnostic term describing patients showing hyperactivity, impulsive behavior, and problems with paying attention (1). Despite the fact that most children at preschool age may show such behaviors, the difference lies in the intensity of given characteristics. If the presence of a given characteristic in a child causes the child to differ from the other children of the same age to a very pronounced degree, then it can be called a

“symptom” (2). Children diagnosed with ADHD show the following symptoms: 1) in the domain of attention problems: inability to concentrate during school lessons or the currently performed task; problems with directing their attention to the correct stimulus (e.g. to the teacher) or with paying continuous attention; making simple mistakes in their schoolwork; problems with following complicated instructions; loss of attention; not completing tasks; problems with organizing their activities; losing stationery which is necessary for their

schoolwork, 2) in the domain of hyperactivity: high motor activity even in situations when it is not approved by others; continuous arm or leg movements; fidgeting in class; getting up from their seat without permission; wandering around the classroom; running when walking is expected; climbing furniture; problems with playing peacefully; loud behavior, and 3) in the domain of impulsiveness: bursting to answer a teacher's question; inability to wait for one's turn; cutting in on the conversations of their peers as well as adults; frequent change of topics during conversation. Although most children are diagnosed with ADHD at school age, Wolańczyk & Komander (3) claim that the syndromes can be observed already in early childhood. What is more, the symptoms do not fade away as the young person is growing up – on the contrary, they often lead to other psychological and social problems (3).

ADHD treatment methods may be divided into two groups – pharmacological and non-pharmacological (3). A review of treatment studies published by Trout, Liemann, Reid and Epstein (4) showed that the literature pays too little attention to research which assesses the effectiveness of intervention for children with ADHD without introducing pharmacological means. Hyperactivity treatment without administering medicines usually focuses on psychoeducation of parents and other people involved in taking care of the child, as well as on applying therapeutic intervention based on the learning theory. The behavioral approach (applied behavior analysis) is recommended due to its effectiveness (5, 6), and also to the fact that the techniques may be used not only by professionals, but also by parents and teachers (7).

One of the basic principles which is a foundation of many behavioral techniques is reinforcement, that is, the process as the result of which the probability of the occurrence of a given behavior increases. Rewarding, especially with praise and appreciation, is very effective in the process of raising typically developing children. In the case of children who do not develop normally, social reinforcement can be aided by additional motivational systems, for instance a token system. Pfiffner (1) states that schoolchildren with ADHD often demand tangible and concrete methods of reinforcing the desirable behavior.

Although the literature reports on the effectiveness of using a token system in a population of children who are not developing normally, very few studies specifically concern ADHD children. They mostly concentrate on modifying behavior in a school environment, even though it is well known that the combination of behavioral therapy conducted in class with training the parents achieves the best results. For instance, Gannon, Harmon and Williams (8) conducted an experiment in which a 12-year-old ADHD boy participated. They introduced a token collecting program at the boy's home, while the participant was doing his homework. The results showed that the boy's concentration on the task being currently performed rose significantly in comparison to his attention level before the introduction of the token system.

One important issue for the evaluation of a therapeutic program's effectiveness is generalization, i.e. the transfer of effects of therapy to other environments and behaviors. Pfiffner (1) claims that ADHD children do not generalize the acquired skills and that they do not transfer them to other settings than the training ones. Research demonstrates that stopping the "token rewards" causes a relapse to the ways of behavior observable before the introduction of intervention (9), unless generalization promoting strategies are applied during therapy from the very beginning. Thus, the occurrence of generalization in ADHD children can be mainly observed in those studies where the procedures are implemented by people in the child's everyday environment, not only the experimenters (e.g. 10, in 9, 11, 12).

Summing up, the scholarly literature concerning therapeutic interventions for children with ADHD demonstrate the token system's usefulness in behavior modification. Nevertheless, this intervention ought to be introduced not only at school, but also at the child's home. Moreover, generalization should be actively promoted. Therefore the aim of the conducted study was to verify the following hypotheses: 1) the introduction of intervention concerning hyperactivity shall decrease the amount of problem behavior related to this symptom and shown at home, 2) the introduction of intervention concerning hyperactivity shall not influence the amount of problem behavior related to the remaining symptoms and shown at home, 3) at home, the introduction of intervention concerning hyperactivity shall not influence the amount of problem behavior related to all symptoms and shown at school.

THE METHOD

Subjects

Three children – boys at the age of eight to nine years – participated in the study. They were second and third grade students at different grammar schools in Warsaw. The children were diagnosed with ADHD and were recruited to the study through recommendation by school psychologists. During the course of the study the children did not take any medicines. Additionally, neither the participants nor their parents attended any therapeutic classes. Every child's parents expressed their written consent for the child's participation in the study, after being informed about the study's procedure. Also the children participating in the study were asked for their consent.

Setting

The study took place at the boys' homes as well as the schools they attended. At the children's homes, the experimental sessions were conducted in a given boy's room, which were rather barren and without many distractions. The observations conducted at school took place in the classrooms, during regularly held lessons. The classroom decoration as well as the arrangement of the seated children did not change during the conducted study.

Procedure and measurement

The experimental sessions took place three times a week. Twice a week at the subject's homes and once a

week at their schools. At home the study took place in the afternoon, while at school – in the morning. The experimental sessions at home lasted 90 min (twice 45 minutes with a 10 minute break between the sessions). During the session, the subjects were sitting at their desk, while their task was to do homework set for the following day. If the homework was done before the end of the session, the subjects performed exercises improving their visual-motor coordination. During the break the boys rested or played with toys. At school, there were no experimental sessions, just observational ones. The subjects were supposed to perform tasks related to the teacher's instructions, just like the rest of the children. During the breaks the subjects passed their time together with their peers.

The behaviors measured during eight weeks of the experiment were three ADHD symptoms: hyperactivity, inattention and impulsiveness. However, the hyperactivity measurement was regarded as the main measurement (MM), while the measurements of inattention and impulsiveness – as supplementary (SM).

Hyperactivity was described as excessive activity. Its symptoms were: 1) nervous movements of arms, legs and feet, or fidgeting on the chair; 2) leaving the seat when remaining seated is required; 3) excessive restlessness or performing actions which do not comply with the standards prevailing in the environment; 4) noisiness at play or problemies with remaining peaceful at rest.

Inattention was defined as engaging in one or more of the following behaviors: 1) making frequent mistakes in schoolwork or other activities; 2) repeated failure to concentrate on the tasks or activities connected with play; 3) lack of reaction to what the child is being told; 4) repeated failure to follow the instructions or complete schoolwork or homework; 5) losing or forgetting items which are necessary for performing the tasks; 6) easy reversibility of attention by external stimuli; 7) forgetfulness during the everyday activity.

Impulsiveness was defined as engaging in one or more of the following behaviors: 1) answering a question before it has been formulated; 2) problems with waiting for one's turn at games and other group situations; 3) interrupting or disturbing others; 4) excessive talking irrespective of social constraints.

To conduct the measurements, the partial interval measurement was employed. The intervention was based on, first, the introduction of the four rules of "good behavior". Their wording was: 1) We sit straight in the chair, 2) During the lesson we sit at the desk, 3) We walk, not run, 4) We behave quietly during classes or at play. Moreover, a token economy was introduced. While being observed, the subject received a token after every 5 minutes of session. The child obtained a token only if during an interval no problem behavior occurred. The awarding of tokens was also accompanied by feedback for the participant: "You behave according to our rules, well done! You get a token" or "You don't follow our rules, you don't get a token". After obtaining a certain number of tokens the subject could exchange them for their prize of choice. For obtaining at least 7 tokens during a 90-minute class the subject

received a "daily" award. This consisted of social activities (e.g., playing a game). After completing the second session of the week, the subject also summed up his tokens. This time, apart from the "daily" prize, he also received a "weekly" prize – a chocolate bar and chewing gum, on condition that during the two experimental sessions (three hours – breaks excluded) the participant collected at least 14 tokens.

Experimental design

The study – but only for the sessions conducted at home – made use of the single-subject experimental design with a return to baseline (the reversal ABAB design). The study began with measuring the baseline before introducing intervention (the "A" phase), next intervention was introduced (the "B" phase or "intervention"), and then both phases were repeated. At school, on the other hand, the measurement was conducted only in the first phase – A, the second phase of the experiment was not administered. The goal was to check if the intervention applied at home would be generalized to the school environment. In all, the experiment consisted of four phases. The first was an initial baseline measurement – the A1 phase, next the intervention – the B1 phase, then a return to the baseline measurement – the A2 phase, and the introduction of intervention yet again – the B2 phase. Each phase lasted two weeks.

RESULTS

The results shall be presented separately for each subject. First discussed shall be the experimental data of the subject „D". Next the subject "A", and last shall be presented the data of the subject "P". The obtained data shall be presented in the following order: the main measurement (MM) – the measurement of hyperactivity at home, the supplementary measurement (SM) – the measurement of impulsiveness and inattention at home and MM at school, then SM at school. In all charts a solid line stands for the main measurement, while a dashed line stands for the supplementary measurement.

The figure for each subject show the percentage of intervals during which problem behavior occurred measured during the sessions at home and at school. During the home sessions (fig. 1, 3, 5) in every phase of the experiment the measurement was conducted four times, except for subject "D" in the A2 phase, when the measurement was conducted three times. On the other hand, during the school observation (fig. 2, 4, 6) in each phase of the experiment the measurement was conducted twice, except for subject "D" in the A2 phase, when the measurement was conducted once. The number of intervals during which there occurred problem behavior, both in the main measure and in the supplementary one, was summed up after each session, separately for each measurement. Next the data was converted into percentages, relative to the total number of intervals.

The results for each phase shall be presented with regard to their level, where low level means 0% to 33%, medium level 34% to 66%, while high level 67% to 100%.

Also presented shall be the data's stability (the discrepancy of the results does not exceed 20%) and the trend (direction in which the line of data is heading).

Subject „D”

In accordance with Hypothesis 1, the intervention applied for hyperactivity (MM) to subject “D” during home sessions caused a decrease in the amount of problem behavior connected with this symptom (fig. 1). In subject “D” in the A1 phase the hyperactivity level was high (M = 70.5%) and the behavior was stable. No trend was observed. On the other hand, in the B1 phase hyperactivity decreased to the medium level (M = 38.5%), the behavior was stable, a downward trend was also observed. In the A2 phase the hyperactivity level was still medium (M = 65.3%) and stable. However, as shown in figure 1, there was a MM increase, in comparison to the amount of such behavior in the B1 phase. In the final phase – B2 – the problem behavior connected with hyperactivity reached

the medium level (M = 38.3%), which was stable. No trend was observed.

The results shown in figure 1 confirm also Hypothesis 2. In the initial period of the experiment, when manipulation of the independent variable was first introduced, observed was a decrease in the level of impulsiveness and inactivity, similar to the decrease in the behavior connected with hyperactivity. Yet in the A2 phase no increase was observed in the behavior connected with impulsiveness and inattention, after the withdrawal of intervention. Therefore the results shown in figure 1 demonstrate that the introduced home intervention for hyperactivity was neutral with respect to the amount of problem behavior connected with the two remaining symptoms. Subject “D” at the A1 phase showed impulsive behavior and inattention at medium level, it was varying from 50% to 75%. In the B1 phase the supplementary measurement was at medium level (M = 41%). The behavior was stable, no trend was observed. The level of impulsiveness and inattention was

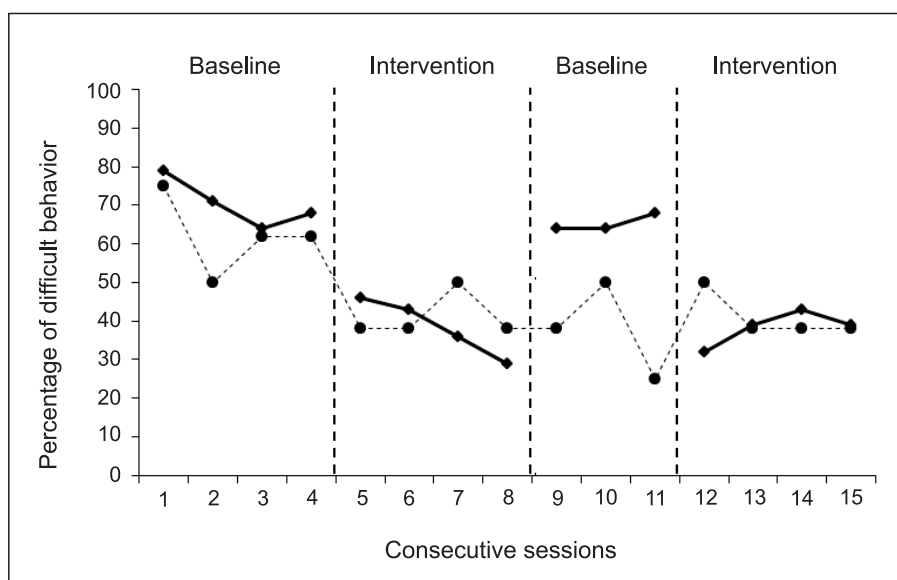


Fig. 1. The percentage of problem behavior occurring during home sessions in subject “D”. Solid line – the measurement of hyperactivity, dotted line – the measurement of impulsiveness and inattention.

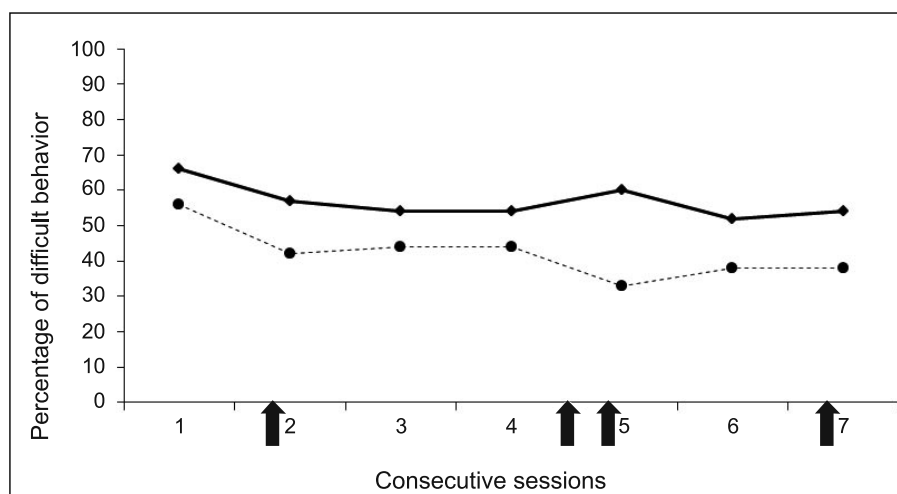


Fig. 2. The percentage of problem behavior occurring during the lessons at school in subject “D”. The arrows on the 0X axis show the period of the experimental manipulation at home. Solid line – the measurement of hyperactivity, dotted line – the measurement of impulsiveness and inattention.

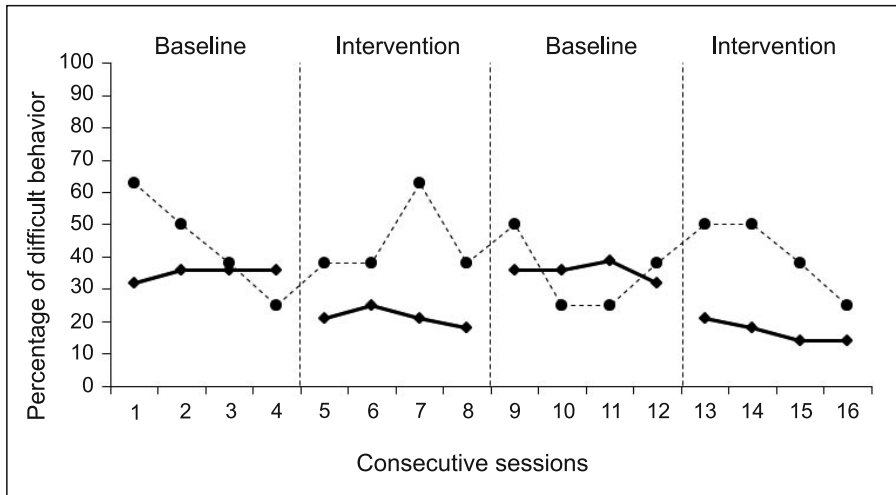


Fig. 3. The percentage of problem behavior occurring during home sessions in subject "A". Solid line – the measurement of hyperactivity, dotted line – the measurement of impulsiveness and inattention.

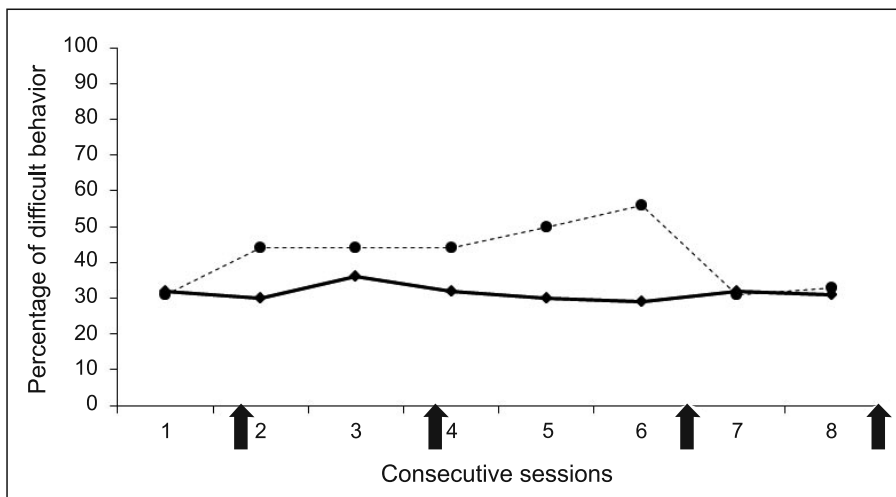


Fig. 4. The percentage of problem behavior occurring during school sessions in subject "A". The arrows on the OX axis point to the period of experimental manipulation at home. Solid line – the measurement of hyperactivity, dotted line – the measurement of impulsiveness and inattention.

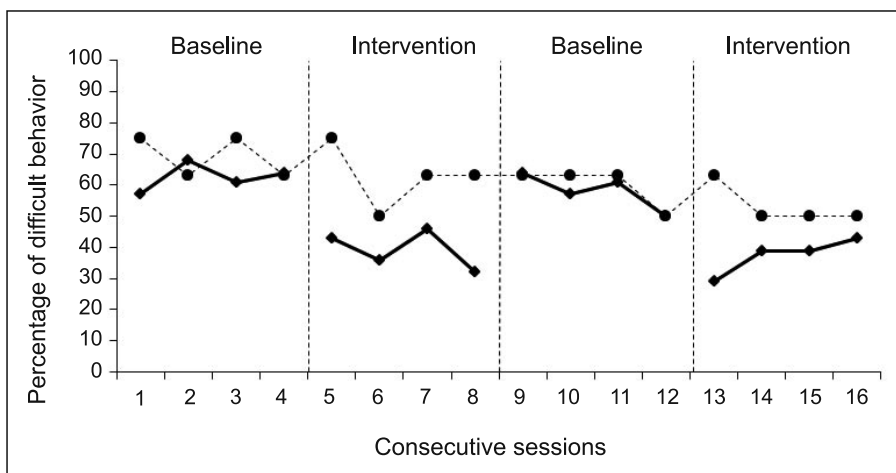


Fig. 5. The percentage of problem behavior occurring during home sessions in subject "P". Solid line – the measurement of hyperactivity, dotted line – the measurement of impulsiveness and inattention.

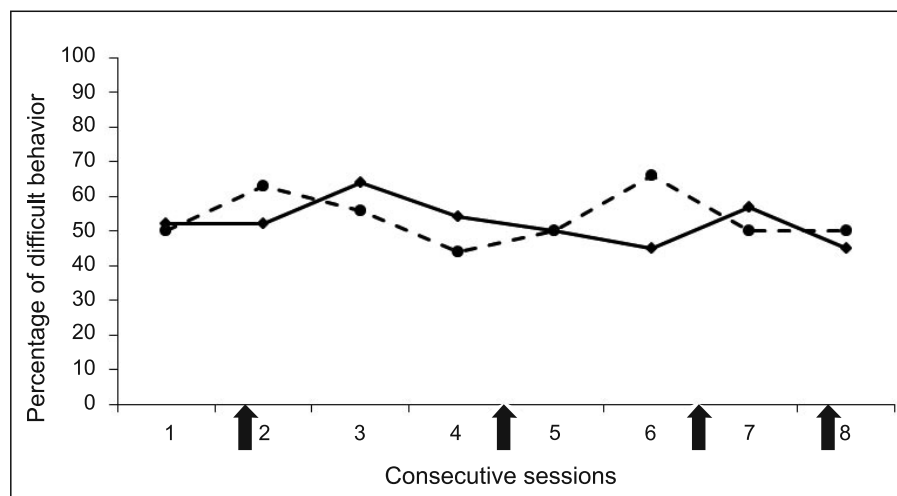


Fig. 6. The percentage of problem behavior occurring during school sessions in subject "P". The arrows on the 0X axis point to the period of experimental manipulation at home. Solid line – the measurement of hyperactivity, dotted line – the measurement of impulsiveness and inattention.

medium in the A2 phase. The behavior was variable, at the percentage varied from 25 to 50. The supplementary measurement in the B2 phase reached medium level (M = 41%). The stability of behavior was observable, as well as lack of any trend.

The assumptions of Hypothesis 3 have also been confirmed. As shown in Figure 2, the decrease in the amount of problem behavior connected with hyperactivity, achieved through home intervention, remains neutral relative to the amount of behavior relating to hyperactivity at school. The main measurement data collected during 7 experimental sessions remain at medium level (M = 56.7%) and is very stable. No trend was observed. The decrease in the amount of problem behavior connected to hyperactivity through home intervention remained neutral relative to the impulsiveness and inattention at school behavior. The supplementary measurement behavior noted during school observation was very stable and remained at medium level (M = 42.1%). No trend was observed.

Subject „A”

The experimental data obtained during sessions with subject „A” confirm Hypothesis 1 (fig. 3). Intervention applied to subject “A” for hyperactivity, during home sessions, caused a decrease in the amount of problem behavior connected with this symptom. For subject “A” in the A1 phase the hyperactivity level was medium (M = 35%) and the behavior was very stable. No trend was observed. On the other hand, during the B1 phase the main measurement decreased to low level (M = 21.3%). The behavior was stable, a weak downward trend was also observed. In the A2 phase hyperactivity returned to medium level (M = 35.8%) and was stable. The final phase – B2 – also presents stable data, which remain at low level (M = 16.8%), additionally a downward trend was observed.

The results demonstrated in figure 3 also confirm Hypothesis 2. The introduction of intervention for hy-

peractivity at home was neutral relative the amount of problem behavior connected with the two remaining symptoms – impulsiveness and inattention. Subject “A” in the A1 phase showed impulsive and inattentive behavior at medium level. It varied a lot and reached the values from 25% to 63%, additionally a strong downward trend was observed. In the B1 phase the supplementary measurement remained at medium level. The behavior varied, achieving values from 38% to 63%, no trend was observed. The level of impulsiveness and inattention in the A2 phase was medium, the reported data was contained between 25% and 50%. The supplementary measurement in the B2 phase remained at medium level, the behavior varied from 25% to 50%. Observed was also a strong downward trend.

The assumptions of Hypothesis 3 were confirmed, too. As shown in figure 4, the decrease in the amount of problem behavior related to hyperactivity through home intervention remained neutral in relation to the amount of problem behavior at school. The main measurement data at school, collected during 7 experimental sessions, remain at medium level (M = 31.5%) and are very stable. No trend was observed.

The behavior connected with the supplementary measurement conducted during the observation at school was relatively stable. Therefore it may be claimed that the decrease in the amount of problem behavior related to hyperactivity through home intervention remained neutral in relation to impulsive behavior and inattention at school. The behavior remained at medium level, achieving the percentage results from 31 to 56%. No trend was observed.

Subject „P”

In accordance to Hypothesis 1, the intervention applied for hyperactivity in subject “P” during individual home sessions caused a decrease in the amount of problem behavior related to the symptom (fig. 5). For subject “P” at the A1 phase the level of hyperactivity

was medium ($M = 62.5\%$) and the behavior was stable. No trend was observed. At the B1 phase, hyperactivity remained at medium level ($M = 39.3\%$), the behavior was stable, and also no trend was observed. At the A2 phase the MM was at medium level ($M = 58\%$) and was stable. However, as shown in Figure 5, an increase in the level of hyperactivity was observed in relation to the amount of such behavior at the B1 phase. At the final phase – B2 – problem behavior related to hyperactivity still remained at medium level ($M = 37.5\%$). No trend was observed.

The results shown in figure 5 also confirm Hypothesis 2. The introduced intervention for hyperactivity at home was neutral in relation to the amount of problem behavior related to the two remaining symptoms – impulsiveness and inattention. At the A1 phase, subject “P” showed impulsive behavior and inattention at high level ($M = 69\%$), it was stable, additionally no trend was observed. Yet at the B1 phase the supplementary measurement decreased to medium level. The behavior varied from 50% to 75%. No trend was observed. The level of impulsiveness and inattention was medium ($M = 59.8\%$) at the A2 phase. The behavior was stable with no trend. The supplementary measurement at the B2 phase reached medium level ($M = 53.3\%$). A very high stability of behavior was observable, as well as lack of any trend.

The assumptions of Hypothesis 3 were also confirmed. Figure 6 demonstrates the fact that a decrease in the amount of problem behavior related to hyperactivity through home intervention remained neutral in relation to the amount of behavior related to hyperactivity which occurred at school. The main measurement data at school collected during 7 experimental sessions remained at medium level. It was unstable, reaching the percentage values of 43-64%, additionally no trend was observed.

The decrease in the amount of problem behavior related to hyperactivity through home intervention remained neutral in relation to impulsive behavior and inattention at school. The supplementary measurement behavior observed at school remained at medium level. Impulsiveness and inattention varied during the measurement, reaching values in between 44% and 66%. No trend was observed.

DISCUSSION

The goal of this study was to investigate the effectiveness of behavioral intervention in the form of a token system on modifying behavior related to three symptoms of ADHD. The analysis of the collected data demonstrates that the application of a token system at home for one of the ADHD symptoms – hyperactivity – decreases the level of this symptom during individual sessions. Additionally, the results of the experiment are consistent with the other predictions. Namely, it has been shown that the application of a token system for hyperactivity at home does not cause any change in the behavior related to this symptom at school. Similarly, rewarding desirable behavior in one domain does not affect the remaining symptoms of the disorder in

question – impulsiveness and inattention – both during individual sessions, and observation at school.

Behavioral psychologists emphasize the fact that the application of a token system without any simultaneous introduction of penalty is one of the most effective ways of modifying behavior (2). Crucially, the collected points should be exchangeable for awards desired by the child. Then they become a factor motivating the child to work on his behavior. The token system is a very effective tool in working with children with ADHD (13 in: 1). During the experiment it was also noticed that motivation to win tokens for obeying the rules was often changing in the case of subjects “D” and “P”. There were moments when the subjects declared to the experimenter that they did not care for awards, and that they did not feel like doing their homework. On the other hand, characteristic of subject “A” was a very strong motivation to collect tokens. Therefore it may be inferred that the token system is an effective tool for the modification of behavior, especially in children who show strong motivation to gain tokens and, therefore, the target prize. Perhaps it so happened during the experiment that the awards were more attractive for subject “A” than for the other subjects. Hence, during any such studies in the future, it may be worthwhile to take into consideration individual choice of awards for each subject.

It is also important that subjects “D” and “P” showed higher levels of problem behavior during the experiment than subject “A”. Therefore they required more attention from the experimenter, and also showed the need for conducting the intervention for a longer time than it was planned in the research design. As claimed by Pffner (1), the token system ought to be applied for several months, or even years, in order to maximize progress both in ADHD children’s academic progress, and in their behavior. Unfortunately, time limits did not allow the researcher to spend more time working with children. Therefore, for any further studies it may be worthwhile to consider the time allocated to the experiment and increase it maximally.

From the obtained results it can be inferred that there is a causal connection between the dependent and the independent variables. In other words, the decrease in the level of hyperactivity after the introduction of intervention, and the increase of this behavior after the withdrawal of reinforcers, were the effects obtained through the applied intervention, and not any external factors. In order to check what was the reason for the change in behavior, one had to withdraw the intervention, in accordance with the ABAB research design procedure (14). Often such experimenter action raises ethical issues because an effective intervention is withdrawn for the sole reason of demonstrating its effectiveness. Hence it might be claimed that in this case the experimenter works to the subject’s detriment by allowing problem behavior to return. However, as claimed by Shaughnessy, Zechmeister and Zechmeister (14), research is conducted in order to demonstrate the effectiveness of the intervention, and hence the application of the ABAB reversal design is a justified solution. As an alternative,

the authors suggest applying a research design whose procedure does not demand the withdrawal of intervention – the multiple baseline design – but they point out the weak aspects of this research design.

Apart from the main goal of the present experiment, which was discussed above, another objective was to check the incidence of the generalization of the intervention effects to other kinds of behaviors and environment. Basing on the response class theory (15), it could have been surmised that the occurrence of the change of behavior related to hyperactivity after the application of intervention would be generalized to the other symptoms characteristic the same disorder. Yet lack of empirical evidence for the above mentioned phenomenon (9) has induced the experimenter to formulate a hypothesis that the effects of the applied intervention for hyperactivity would be neutral in relation to the other syndromes of the Attention Deficit Hyperactivity Disorder – impulsiveness and inattention – during home sessions. The obtained results confirm this supposition. Thus, rules created for decreasing hyperactivity have no reference to impulsive behavior or inattention. In order to improve the procedure for further studies, it may be worthwhile to introduce an intervention for all symptoms.

Apart from the process of generalization of reaction, the study attempted to investigate the occurrence of generalization in relation to showing new kinds of be-

havior in a different environment than that of the training. It was assumed that intervention applied at home for hyperactivity would cause no change in the percentage of problem behavior related to both hyperactivity, and impulsiveness and inattention at school. The results of the study turned out to confirm the predictions. Data analysis leads to the conclusion that in the case of subjects “D” and “A” behavior related to hyperactivity at school was very stable. This attests to a lack of any influence of home intervention on behavior at school. Only subject “P” showed instability of behavior at school, yet changes occurring during consecutive observation sessions did not depend on the intervention for hyperactivity, applied at home.

To sum up, the conducted study has demonstrated that the token system is an objectively effective intervention, causing a decrease in the intensity of symptoms related to hyperactivity in three boys with ADHD. Yet the effects of the intervention were not generalized to other symptoms of the disorder or to school environment. Further research should design a more developed intervention which would fit a larger number of problems experienced by ADHD children. Nevertheless, the merit of the conducted experiment consists in an empirical proof that non-pharmacological intervention can modify certain kinds of behavior characteristic for ADHD effectively.

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