

AGNIESZKA SZYMAŃSKA
University of Warsaw

PARENTAL DIRECTIVENESS AS A PREDICTOR OF CHILDREN'S BEHAVIOR AT KINDERGARTEN

The research aimed to describe the differences in preschool children's families in terms of parental influence. One of the important factors predicting a child's behavior at kindergarten was parental directiveness. Directiveness was conceptualized as one of the acts of speech by which the speaker coaxes another to do something. Two types of directiveness were distinguished: warm-hearted directiveness and aggressive directiveness. Two hundred and four participants, parents of kindergarten children, took part in the research. Selection for the research sample was conducted according to the teacher's representation of a child's behavior at kindergarten (well-behaved or badly-behaved). Parents completed psychological tests measuring their level of parental control (conceptualized as teaching the child the rules of social behavior) and, finally, the level and type of directiveness (warm-hearted or aggressive). The purpose of the analysis was to discover which of the enumerated variables best explained a child's behavior at kindergarten. Canonical correlation, discriminant analysis and data mining methods were used for the analysis. Analyses were performed with the help of the Statistical Package for Social Sciences (SPSS) and STATISTICA Data Miner 8 software. The results indicate that the level and type of parental directiveness is the most important factor that distinguishes children in groups, the split being due to the children's behavior at kindergarten.

Key words: warm-hearted directiveness, aggressive directiveness, parental control, obedience enforcement, parental difficulty, data mining

Discussions on the influence of parental communication style on a child's adaptation abilities and style of maintaining interaction with other children seem to have no end in the sciences dealing with the problem of parent-child interaction. Over the last 50 years, however, researchers have collected a lot of evidence for and against the claim that parents influence their children's inner representations of the world and the way children communicate with their surroundings. Parental influence can express itself in many different forms, communication style being

among the most important. The aim of the present study was to investigate which construct most widely explains a child's behavior at kindergarten and to find the strongest predictor of a child's behavior at kindergarten.

In order to find the answer, three methods of model building were used: canonical correlation, discriminant analysis and data mining.

Directiveness

The influence of parental directiveness style on a child's behavior is a controversial topic in parent-child interaction psychology. Some analyses suggest that parental directiveness has a positive impact on a child's social abilities; others claim something completely opposite (Carlson Jones, 1980; Rose Krasnor, 1996; Pettit et al., 1988; Goodman et al., 1999; Krasno, Rubin, 1983; Stewart, 1995; Szymańska, 2009; Del Vecchio & O'Leary, 2008). Westerman and Kuczyński say that whether parental directiveness is a positive or negative influence depends on the context in which it is used (Westerman, 1990; Kuczyński, 1984).

Controversy surrounds not only the influence of parental directiveness on a child's development but also the construct of directiveness itself. A heated discussion arose when John Ray published his directiveness scale (1981, 1984^a, 1984^b, 1986). Since then Ray has had to struggle to protect his construct of directiveness (1988). Many scientists from all over the world could not accept the construct of directiveness conceptualized by the statement "This scale was originally designed to pick out the sort of person who is prone to behave as the Nazis did – in an aggressive, domineering and destructive way towards other people" (Ray, 1984, p. 145). Different understandings of the construct resulted in much criticism, but criticism was also raised due to the lack of a relevance indicator in the scale. The problem of indicator accuracy is a very important methodological issue (Nowak, 2007). Usually such inaccuracy strongly undermines achieved results (Aranowska, 2005).

A deeper analysis of dictionary definitions suggests that directiveness depends on intercultural differences. According to a Polish dictionary, directiveness means "a guideline concerning behavior: recommendation" (Szymczak, 1978, p. 487). Webster's, a standard American dictionary, describes directive as "tending or intended to direct, indicating direction, a general instruction or order issued authoritatively" (Guralnik, 1986, p. 399).

The main difference is in the word "authoritatively." In Polish, being directive has no negative connotation – it simply means giving instructions. The word "authoritatively" also has a different connotation and describes a person who receives "respect, [and is] credible, trustworthy" (Szymczak, 1978, p. 102). Webster's describes an authoritative person as "having or showing authority, based on competent authority, reliable because coming from one who is an expert or properly qualified, asserting authority, fond of giving orders, dictatorial" (Guralnik, 1986, p. 94). The dictatorial person is "autocratic, tyrannical, domineering" (Guralnik, 1986, p. 392).

In American English, the words directive, authoritative, dictatorial, and tyrannical are synonyms, but they are not in Polish, in which an authority is a “person, institution, doctrine having special respect in a certain area” (Szymczak, 1978, p. 102). The American meaning of this word, by comparison, is “the power or right to give commands, enforce obedience” (Guralnik, 1986, p. 94).

Deep semantic analysis of these words allows us to understand how different the experiences of directiveness in Polish and American culture are, despite appearing similar. This is why deeper analysis and criticism is so important when considering studies of directiveness.

The Dictionary of Psychology describes directiveness as an “act of speech by which a speaker wants to coax a listener to do something, for example: ‘close the door please’” (Reber, 2005, p. 172). Searle distinguished directiveness as one of the five acts of speech by which people communicate with each other (Searle, 1983). According to these definitions, even a normal question such as “what time is it?” is directive speech by means of which the speaker coaxes a listener into doing something. A non-directive person avoids situations in which they would have influence over others. But apart from when they are avoiding exerting influence on others, people are directive. While directiveness depends on the situation, the type of directiveness, the way somebody communicates with others, is characteristic of the person and might depend on personality. Directiveness is the style of exerting influence over others. The opposite of directiveness is non-directiveness, which can be described as the avoidance of exerting influence. As mentioned above, two types of directiveness have been distinguished: warm-hearted directiveness and aggressive directiveness. **Warm-hearted directiveness** is a way of exerting influence that is characterized by a positive attitude toward others, avoiding repulsing and humiliating them. **Aggressive directiveness** is a way of exerting influence that is characterized by a negative attitude toward others, in which hostile behavior and humiliation are applied. This type/kind of directiveness can have a destructive influence on others. To measure a parent’s level and type of directiveness, the DAiS (Aggressive and Warm-Hearted Directiveness¹) scale was invented.

Parental control

Schaefer’s circumplex model confirms the real, not only theoretical, existence of the parental control phenomenon. Parental styles, distinguished by the American researcher with the help of Exploratory Factor Analysis (EFA), the method most remote from a theoretical analysis, confirmed the discrepancy between and at the same time the coexistence of control and autonomy in upbringing. The factor located at the opposite pole of strong control had the original name of “autonomy” not “weak control” which was later widespread (Schaefer, 1959). It is not clear why the name was changed in subsequent courses of parental control analysis.

¹ The acronym comes from the Polish name: Dyrektywność Agresywna i Serdeczna.

Parental upbringing styles, as presented by Schaefer in the circumplex model, are arranged on two axes: control and autonomy, love and hostility. On the basis of Exploratory Factor Analysis Schaefer claimed that mothers' behaviors decompose on these two dimensions, i.e. 1) control-autonomy and 2) love-hostility (1959). Baumrind made comparisons of research concerning parental control (1966). The analysis showed that lack of control does not favor a child's development but that parental control should be "warm." Control described in this way attracted much criticism but also positive resonance (Baumrind, 1983). The element of *warm* control was criticized for not being substantive and inaccurately describing the phenomenon. In spite of the lack of consistency in the assessment of Schaefer's and Baumrind's ideas, their undoubted contribution to science lay in paying attention to an important issue, namely a child's reception of a parent's behavior being more significant for the child's development than the parent's real behavior. Their hypothesis was confirmed by Bugental's research (1970). Bugental measured a child's reaction in a situation where the adult's behavior was incoherent, in, for example, tone of voice, facial expression and the sound of the voice. The results show that the adult's ambiguity, the child's inability to understand him/her, is very stressful for the child. Ambiguity, which a child cannot interpret, leads to adverse or negative conclusions despite the fact that a positive interpretation would also be justified. When a child cannot resolve the experienced inconsistency, he/she draws negative conclusions (Bugental, 1970). When children do not understand an adult, they tend to adopt strategies of passive emotion regulation; they become passive as a consequence of using their protection mechanisms, which they use in ambiguous situations (Bugental, 1999).

It seems that *warm control* is likely to be clearer to a child. It does not evoke cognitive dissonance: a loving parent on one side and a harsh authority on the other. When a parent uses *warm control* his/her representation in the child's mind might be more consistent.

In the repertoire of parental control behaviors, Schaefer included care for a child's health, domination, emotional engagement, emotional bonding with a child, and intrusive behaviors. Parental control is connected to strong influences on the child; autonomy is connected to the avoidance of exerting influence (Schaefer, 1959).

Parents, to a greater or lesser degree, can control a child's upbringing process. They can influence the child or expect that the child itself will assimilate values and proper attitudes. Whether or not the parent controls the upbringing process, depends on their representation of the child as a person who is guided and their representation of themselves as a guider. It can be expected that the parent whose self-representation is that of a guider has an obligation to teach the child the rules and the child should listen to him/her. The parent who does not have such representations can have different expectations and a different attitude to the distribution of rights and duties in the upbringing process.

A parent can expect that the child should assimilate rules on his/her own and that the parent's role is only constrained to maintaining discipline. It is very probable

that different groups of parents have different representations of parental control. Differences in parental representation can result in different behaviors toward a child and in different experiences for that child. Children who are expected to choose values and proper attitudes can experience more freedom and autonomy but, on the other hand, they can experience more defeat because they are deprived of full instructions. Such children have to learn which behaviors benefit them and which do not on their own, by trial and error.

A child's intellectual ability to cope with situations is quite a different matter: can a child's mind at such an early age cope with the complexities of different social behaviors and their results? Finally, the matter can also be considered from an ethical point of view, whether it is right and does not harm children to deprive them of useful knowledge in the name of the right to freedom and autonomy.

This is one of the basic research questions to which an answer was sought by comparing parental control in groups that were selected according to the level of children's difficult behavior at kindergarten.

The study also sought to find out whether parental control must necessarily be connected with violating a child's autonomy. It was assumed that demanding obedience from children, absolute subordination in a situation when they did not adopt the rules, can interfere with a child's autonomy as well as the process of rule assimilation. Forcing children to conform to parental orders, in situations when they did not assimilate values, can provoke resistance. To measure the control thus conceptualized (defined), the psychometric tool PAiNK (Parental Control and Lack of Control scale²) was developed (Szymańska, 2009^a). The tool consisted of three scales: parental control, lack of parental control and obedience enforcement.

The tool comprised descriptive stories. Each story described some parental difficulty or educational problem with the children, for instance, misappropriation of toys, anger, telling lies, coercion etc. Each story had four endings, two of which were characterized by parental control (understood to mean the parent's sense of control being applied and thus influencing the child by teaching him/her the rules and inculcating values). The other two measured the lack of control, meaning that it was the parent's conviction that what children learn depends on them. Additionally, a scale measuring the demand for immediate obedience was introduced to the tool.

Parental difficulty

When analyzing research on parental difficulty we need to take a closer look at the concept of difficulty. Some researchers refer to the characteristics of the child (Bugental, 1985; Czwartosz, 1989; Dryll, 1995), others to the parent's inner experiences (Gurycka, 1990; Szymańska, 2010). When such different defined ranges of the concept are involved, this raises the question of the proper selection of indicators with the aim of inferring the existence of the phenomenon.

² The acronym comes from the Polish name: Pomiar Akceptacji i Nieakceptacji Kontroli
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Difficulty in psychology is an inner state characterized by tension, caused by a “difficult situation” which, of necessity, puts a person in a position to admit discrepancy (Reykowski, 1966; Gurycka, 1979; Kochańska, 1982). This is the motivation level reaction to discrepancy.

In the present analysis, experiencing of difficulty by a parent was understood to be the parent’s inner emotional experience which has its roots in the child’s upbringing process and is a consequence of a discrepancy between the assumed goals (traits that the parent wants to develop in the child) and the child’s actual state (the level of development of the trait in the child).

Experiencing difficulty carries a message that the range of concepts is the same as the range of concepts of psychological stress, i.e. it refers to difficult situations (Reykowski, 1966).

Experiencing difficulty is different from positive stress, which appears as a result of a very positive experience, e.g. getting married, the birth of a child, etc. (Ledzińska, 2000). Introducing an adjective to the name of the concept, such as *parental* or *upbringing*, constrains its range only to situations connected with a child’s education. The same construct defines parental inner experiences of stress, which are constrained to interactions with a child. Parental difficulty – as defined in the present paper – is a construct of a completely different range than that used by other authors (Czwartosz, 1989, Dryll, 1995, 2001) who used it to describe a child’s representation in the parent’s (or teacher’s) mind (well-behaved, badly-behaved).

A difficult situation is a colloquial notion and has an unspecified range, a “situation can be difficult or not depending on who has experienced it” (Reykowski, 1966; p. 181). The analysis of parental difficulty requires the assumption that experiencing difficulty is a very subjective experience. In the present analysis, we only consider the intensity of the experience and not its variety.

Method

Measurement tools

DAiS scale – the scale measures parental warm-hearted and aggressive directiveness. For warm-hearted directiveness, the mean is $M = 98.5$ and the standard deviation is $SD = 11.32$, with a standardized error of measurement $SEM = 3.93$. For aggressive directiveness, the mean is $M = 45.21$ and the standard deviation is $SD = 6.52$, with a standardized error of measurement $SEM = 3.35$. The reliability of the scale was measured using Cronbach’s α , which for warm-hearted directiveness was $\alpha = 0.874$ and aggressive directiveness $\alpha = 0.731$. The reliability of the items for the warm-hearted directiveness scale was in the range of $r = 0.191-0.649$. The reliability of the items for the aggressive directiveness scale was in the range of $r = 0.209-0.479$.

PAiNK scale – measures the level of parental control and obedience enforcement. The reliability of the parental control scale is Cronbach’s $\alpha = 0.628$, for

obedience enforcement $\alpha = 0.707$. The reliability is not high due to the fact that the PAiNK scale is not an item but a stories scale that obstructs the achievement of high reliability.

Parental difficulty - Information about the level of parental difficulties experienced in this relationship was gathered by asking the question: *How would you assess your relationship with your child?* Parents answered on a 5-point scale (5 = extraordinarily difficult, 1 = very good).

Participants and procedure

The study was conducted on a Polish sample. To deduce the children's social abilities and behavior, kindergarten teachers were asked to identify the three most difficult and the three best-behaved children in their groups. This way, two groups of children belonging to two ends of one continuum were selected. The parents of these children were asked to take part in the research. Two hundred and four parents of children aged 4 to 6 years: 102 mothers and 102 fathers took part in the research. Parents were asked to complete the DAiS scale, the PAiNK scale and the Parental difficulty scale.

The study analyzed the results for the parents of the two groups of children. The group of badly-behaved children's parents consisted of 102 participants: 51 women and 51 men. Their ages ranged from 24 to 57 years ($M = 35.17$, $SD = 6.433$). The group of well-behaved children's parents consisted of 102 participants: 51 women and 51 men. Their ages ranged from 22 to 57 years ($M = 34.77$, $SD = 5.503$).

Research questions and hypotheses

The purpose of the analysis was to answer the following research questions:

- Does parental communication style (directiveness) influence a child's behavior?
- Does parental control influence a child's behavior?
- Does obedience enforcement influence a child's behavior?

With reference to the research questions, four hypotheses were put forward:

1. The warm-hearted directiveness parental style plays a significant role in shaping a child's good behavior. This hypothesis was put forward on the basis of the intuitive premise that a child would imitate a parent's communication style which might affect his/her relationships at kindergarten.
2. Parental control, understood to mean teaching a child the social rules, has a significant impact on a child's good behavior at kindergarten. This hypothesis was put forward on the basis of the knowledge that a human's ability to manifest social behaviors and react in a social situation with regard to other people is not an inborn ability. It was then hypothesized that a child who gets information from a parent as to how to behave properly would also manifest more social abilities that would positively influence his/her relations at kindergarten.

3. Immediate obedience enforcement does not affect a child's behavior in a good way as it does not allow the child to think about the rules. The hypothesis was constructed in this way due to the fact that when a parent demands that a child do something and he/she does not give the child time to think about the rules, this can have a negative rather than a positive influence on the child's abilities. A child needs time to adopt rules to understand their meaning.
4. Parental aggressive directiveness influences a child's behavior in a negative way. It enforces a child's aggressive behaviors at kindergarten, which, as a consequence, is perceived by the kindergarten teacher as the child's bad behavior.

The variables which would have the strongest effect on a child's behavior were not specified – the answer to this question was expected to emerge from empirical searching during the construction of the models.

Methods of data analysis

To answer the research question, rigorous analyses were chosen to enable exploratory analysis to be conducted. Three methods were chosen: discriminant analysis, data mining and canonical correlation.

Discriminant analysis is one of the statistical methods that contributed to the development of data mining methods (Nisbet, 2009). It builds a model whose purpose is to assign participants to categories (in this case well-behaved or badly-behaved children's groups) with the greatest accuracy. The assigning is supported by the assistance of predictors (parental directiveness style, parental control, obedience enforcement and experienced parental difficulty). Independent variables (predictors) which significantly explain the target (dependent) variable stay in the model, others are excluded. All significant variables are then used to calculate predicted membership of the group for each participant. Since real group membership is known, it is possible to compare the categories to which participants were assigned by the model with their true categories. If there is a discrepancy between the group membership of each participant calculated by discriminant analysis and the group membership of each participant in the data, the estimation error grows and the model's accuracy is reduced; the stronger the discrepancy between the estimated and the real memberships in the group, the lower the accuracy of the model (Kinnear, 2008).

Discriminant analysis is useful in defining how well a child's behavior at kindergarten can be described based on knowledge of parental communication style and other predictors. If the accuracy of the model is high, we could define which of the parental behaviors most strongly determine the child's behavior.

Data mining uses mathematical algorithms to discover hidden information in data. Data mining builds models and estimates the error rates of the models. The error rate estimates how well the model can be used for prediction; the greater the

error rate, the smaller the reliability of the model (Nisbet, 2009). Data mining uses elements of artificial intelligence and is generally the method of decision making (Nisbet, 2009; Rutkowski, 2006). The researcher distinguishes the target variable and input variables, which are the same as the predictors in the regression models. The constructed models contain only those variables which are significant, other variables are rejected.

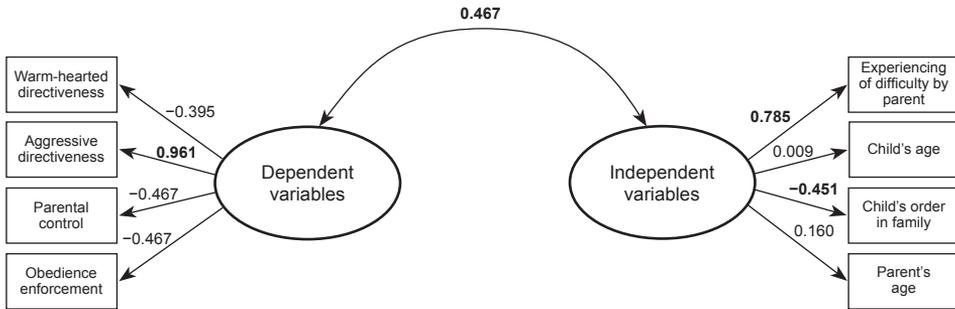
The mathematical algorithm used in the research is C&RT (Classification and Regression Tree). The algorithm builds a decision tree graph which represents the input of the predictors in explaining the target variable. The data mining method (in this case C&RT) differs from discriminant analysis in the mathematical process of obtaining the final results. The C&RT algorithm uses the predictors and performs the function so as to maximize the homogeneity of the groups. The algorithm calculates the splitting point, i.e. the level of the variable at which a person is classified in a different group. Discriminant analysis does not provide such an opportunity. It gives general information on which variables differentiate the groups. The variables are arranged in order. It resembles the category of predictors which are presented starting from the most to the least useful for explaining the dependent variable.

The C&RT algorithm also arranges the predictors according to their importance in explaining dependent variable (target variable) but at the same time it provides the splitting points. Such a structure of the decision tree enables the reconstruction of the differentiation, which is extremely useful when interpreting the results.

Canonical correlation helps to find correlations between sets of dependent and independent variables. It combines dependent variables in one latent structure and independent variables in another. The two structures are correlated with each other. The subject of the analysis is not only the correlation between the latent constructs, but also the evaluation of which variables are the most strongly associated with the latent structures (Kinnear, 2008; Nosal, 1987; Chlewiński, Grzywa, 1987). In the case of the current study, canonical correlation is used to describe differences between the connections of the dependent variables (warm-hearted directiveness, aggressive directiveness, parental control and obedience enforcement) and the independent variables (experienced parental difficulty, the child's age, the child's order in the family and the parent's age) in the group of well-behaved children and separately in the group of badly-behaved children. This procedure enables the differences between the groups of parents to be estimated, and it estimates just one correlation between two sets of variables (this is its incontrovertible advantage over Pearson's correlation). Thanks to canonical correlation, we can avoid difficulties connected with the small interpretability of the correlation matrix.

Canonical correlation is the statistical method that contributed to the development of Structural Equation Modeling (SEM). The same rule as that used in canonical correlation, building latent constructs from other variables, was later applied in the development of structural equation models (Aranowska, Rytel, 2010).

Figure 1. Results of canonical correlation in the sample of badly-behaved children’s parents



Results

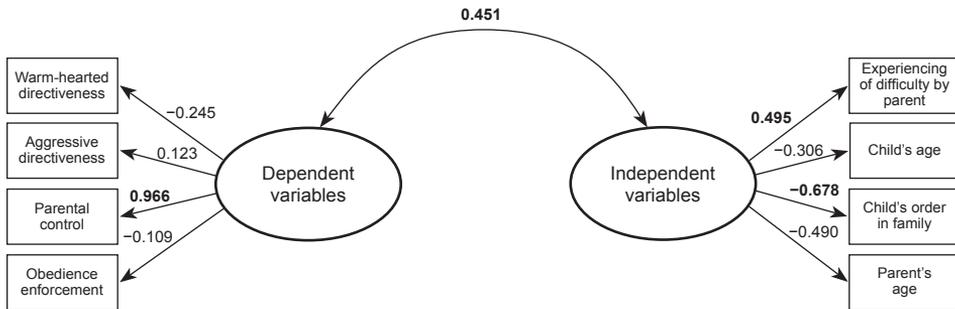
Canonical Correlation

Canonical correlation was conducted for the two groups separately: for the group of badly behaved children’s parents and for the group of well-behaved children’s parents. The dependent variables in the analysis included: warm-hearted directiveness, aggressive directiveness, teaching the rules of social behavior (parental control), obedience enforcement. The independent variables included parental difficulty, the child’s age, the child’s order in the family and the parent’s age. The correlation between the two sets of variables, dependent and independent, is medium $r = 0.467$.

Canonical correlation revealed that in the group of badly-behaved children’s parents, aggressive directiveness was the most important of the dependent variables in the latent construct. Its input was (0.961), while other variables like warm-hearted directiveness, parental control and obedience enforcement appeared to be insignificant. Among the independent variables, experiencing of difficulty by the parent (.785) and the child’s order in the family (-0.451) had the greatest input in the latent construct. The results are presented in Figure 1. The results indicate a very important dependence: in the families of badly-behaved children, when parents experience difficulties they strengthen aggressive communication.

In the group of well-behaved children’s parents, parental control was the most important among the dependent variables in the latent construct. Its input was (0.966) while the other variables were insignificant. Among the independent variables, experiencing of difficulty by the parent (0.495) and the child’s order in the family (-0.678) had the greatest input in the latent construct. The results are

Figure 2. Results of canonical correlation in the sample of well-behaved children's parents



presented in Figure 2. The correlation between the dependent and independent variables is medium $r = 0.451$. The results indicate a very important dependence: in the families of well-behaved children, when parents experienced difficulties (which they might consider to be the child's fault) they strengthened parental control, in the sense that they started to teach the child the rules of social behavior. This effect is strengthened if the child is younger.

Data mining

Data mining was the second method used in the analysis. Four techniques of model prediction were used: Classification and Regression Trees (C&RT) and CHAID, Automated Neural Networks, Boosted Trees, SVM MarsSplines. Classification and regression trees (C&RT) best predicted unscheduled data. The data reliability of the C&RT model was 75.68%, the trial error was 24.35% and the testing sample error was 24.32%.

The lift chart shows that the classification and regression trees (C&RT) model is the best among the available models for prediction purposes. The lift value due to using the C&RT predictive model is approximately 1.5 (Figure 3) for the well-behaved children's group and 1.63 for the badly-behaved children's group (Figure 4).

The classification matrix for testing the data set in Output 1 shows the number of cases that were correctly classified and those that were misclassified as the other category in the C&RT method.

The overall model could correctly predict whether a child's behavior at kindergarten was good or bad with 75.68% accuracy (overall hit ratio). The percentage of correct predictions was 81% for the well-behaved children's group and 70.5% for the badly-behaved children's group.

Figure 3. Lift value for the well-behaved children's group

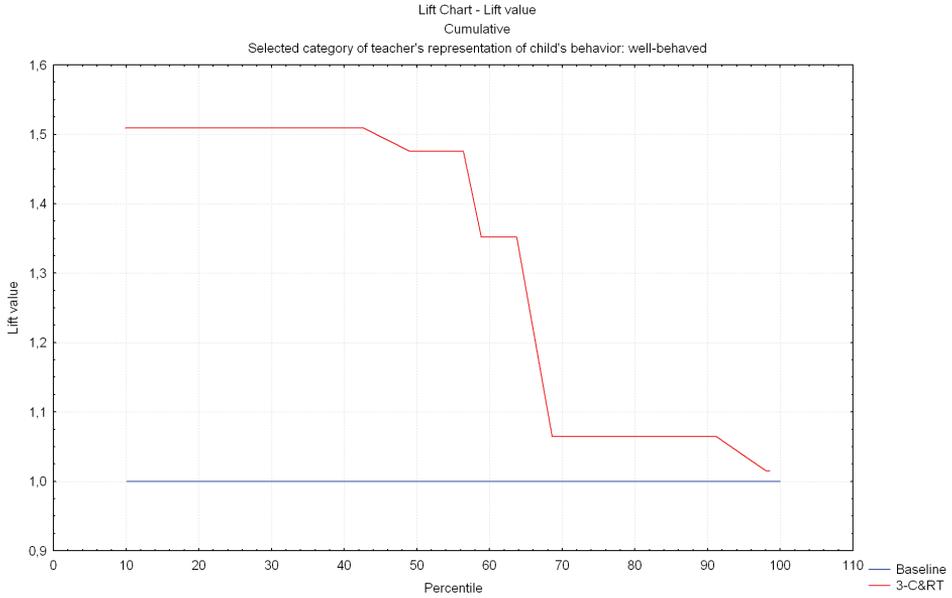
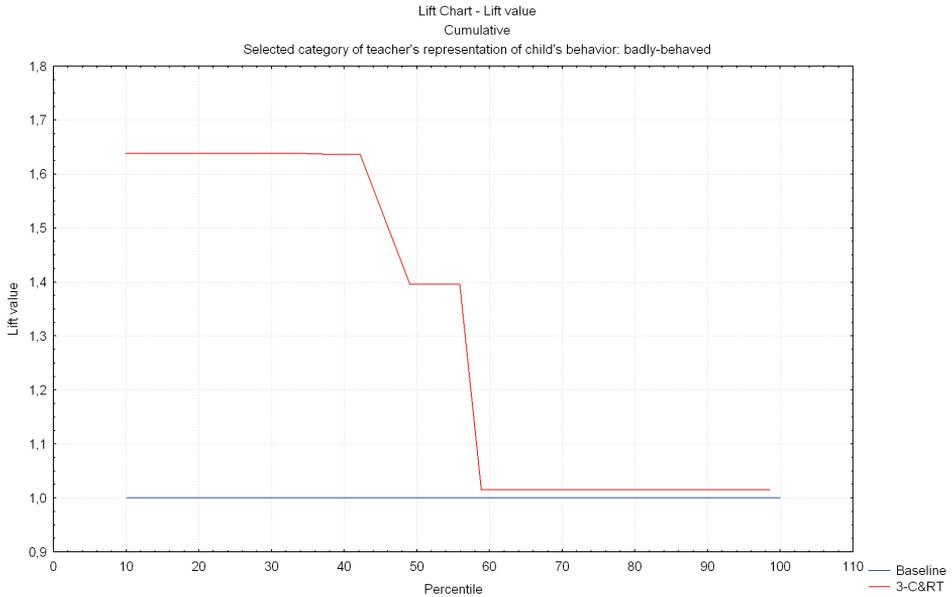


Figure 4. Lift value for the badly-behaved children's group



Output 1. Classification matrix for testing data

Creditability	Predicted as well-behaved	Predicted as badly-behaved	% correctly predicted
Observed: well-behaved	64	15	81.00%
Observed: badly-behaved	26	62	70.50%
Overall Hit Ratio			75.68%

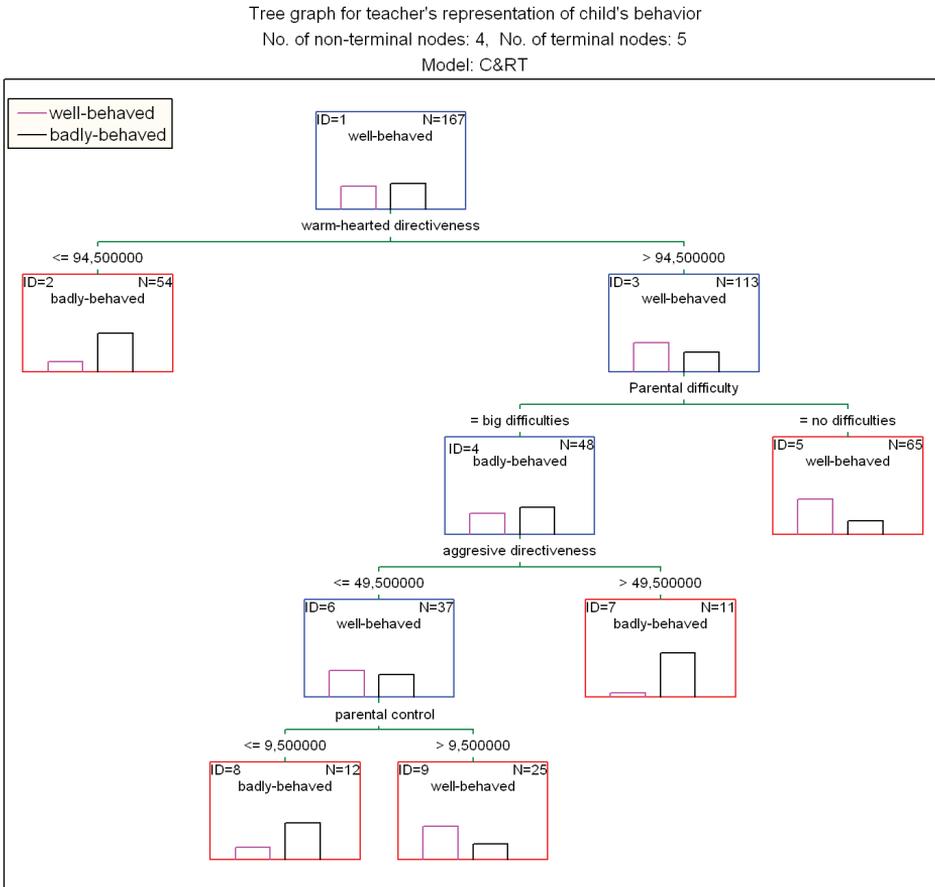
Output 2 presents the importance of the predictors. Parental control is the most important variable from the nine selected, due to its input in the build of the whole tree, but not as the main variable that separates the groups. The second most important variable is obedience enforcement, warm-hearted directiveness is third and aggressive directiveness is fourth.

Figure 5 illustrates the tree structure. Warm-hearted directiveness is the first split variable which builds the biggest-sized node. The algorithm found a splitting point that distinguished the well-behaved children's group from the badly-behaved children's group. The rule is: when warm-hearted directiveness is less than 94.5, the badly-behaved children's group is distinguished; when warm-hearted directiveness is more than 94.5, the well-behaved children's group is distinguished. The node size is 167 (Output 3). The algorithm distinguished two groups: one consists of 54 people who apply a low level of warm-hearted directiveness and their children behave

Output 2. Importance of predictors in the Classification and Regression Trees (C&RT)

	Variable - Rank	Importance
Parent's age	31	0.310164
Warm-hearted directiveness	85	0.853400
Aggressive directiveness	79	0.791296
Obedience enforcement	95	0.949868
Parental control	100	1.000000
Education level	44	0.439196
Child's age	27	0.267326
Child's order	10	0.098538
Experienced parental difficulty	70	0.695388

Figure 5. Decision tree results - Classification and regression tress (C&RT)



badly at kindergarten, the other is heterogeneous and consists of 113 people who apply high warm-hearted directiveness. The latter group includes both children who behave well and badly. The algorithm performed a function to differentiate group membership with the help of other predictors.

The second split is on parental difficulty. The rule is: when parents communicate that they have no difficulties, the well-behaved children's group is distinguished. This group is homogeneous and consists of 65 people. When parental difficulty is *great difficulties* or *some difficulties*, a heterogeneous group of 48 people is distinguished. This group includes both children who behave well and badly. For this group the algorithm performed a third function. The node size is 113 (Output 3). The third split is on aggressive directiveness. Again, the rule is: when aggressive directiveness is more than 49.5, the badly-behaved group is distinguished

Output 3. Tree structure in the Classification and Regression Trees (C&RT)

	Number of nodes	Size of node	N in well-behaved class	N in badly-behaved class	Selected category	Split variable	Criterion for child 1
1	2	167	79	88	Well-behaved	Warm-hearted directiveness	$x \leq 94.5000$
2		54	11	43	Badly-behaved		
3	2	113	68	45	Well-behaved	Parental difficulty	Great difficulties, some difficulties
4	2	48	21	27	Badly-behaved	Aggressive directiveness	$x \leq 49.5000$
6	2	37	20	17	Well-behaved	Parental control	$x \leq 9.5000$
8		12	3	9	Badly-behaved		
9		25	17	8	Well-behaved		
7		11	1	10	Badly-behaved		
5		65	47	18	Well-behaved		

(11 people); when aggressive directiveness is less than 49.5, a heterogeneous group is distinguished. The node size is 48 (Output 3). For this group, a fourth function was performed.

Finally, the fourth and last node is parental control. The rule is: when parental control is more than 9.5, the well-behaved children's group is distinguished; when parental control is less than 9.5, the badly-behaved group is distinguished. The results are shown in the decision tree (Figure 5) and the tree structure (Output 3).

Thanks to the method of Classification and Regression Trees (C&RT), it was possible to identify variables which explain membership in the group of well-behaved and badly-behaved children. Warm-hearted directiveness, experienced parental difficulty, aggressive directiveness and parental control are variables which best explain children's behavior at kindergarten.

The C&RT algorithm distinguished five groups of parents and their children:

Group one is the group of badly-behaved children's parents who do not apply warm-hearted directiveness. We can say that children in this group are deprived

Output 4. Statistics of the discriminant functions

Function	Eigenvalue	% of variance	Cumulative %	Canonical Correlation	
1	0.267	100.0	100.0	0.459	
Test of Function	Wilk's Lambda	Chi-Square	df	Sig.	
1	0.789	47.637	2	0.000	

of instructions but they are also deprived of friendly conversation with a parent. This group consists of 54 parents.

Group two is the group of children whose parents apply high warm-hearted directiveness and they do not experience difficulties in their relationship with their children. Their children behave well at kindergarten. This group consists of 65 people.

Group three is the group of children whose parents apply high warm-hearted directiveness but they also use high aggressive directiveness. Parents of these children experience lots of difficulties with their children and the children behave badly at kindergarten. This group consists of 11 people. Mixing aggressive directiveness and warm-hearted directiveness is not good for children.

Group four is the group of children whose parents apply high warm-hearted directiveness, they experience lots of problems with their children but they do not apply aggressive directiveness. Instead, they apply parental control and teach their children the rules of social behavior. Their children behave well. This is a group of 25 people. It is a very special group whose existence was discovered by the algorithm. It shows that in the case of experienced difficulties, when parental control is used by the parents to cope with the situation, this brings positive results.

Group five is the group of children whose parents apply high warm-hearted directiveness, they experience lots of problems with their children but they do not apply aggressive directiveness. They also do not apply parental control, they do not teach their children the rules of social behavior. Their children behave badly. This group consists of 12 people.

Discriminant Analysis

The third and last method used in the calculations was discriminant analysis. It was used to create a model that could predict children's behavior at kindergarten (good or bad). Discriminant analysis could be used because all the variables were numerical (Kinnear et al. 2008). In the analysis, a child's behavior was treated as a dependent variable (it was the only non-numerical variable in the data) and the model was built to explain it. The style of parental directiveness (aggressive or warm-hearted), parental control and obedience enforcement were numerical predictors.

Output 5. The Structure Matrix

	Function
Parental difficulty	0.835
Warm-hearted directiveness	-0.688
Aggressive directiveness	0.291
Child's age	-0.065
Obedience	-0.034
Parental control	0.019
Child's order	-0.012

The stepwise method was used in the analysis. Its purpose is to enter and remove variables from the model along with the values of Wilk's lambda and the associated probability levels (Kinnear et al. 2008). Only two variables entered the model. They were: parental difficulty, which in the first step achieved F to enter value equal to 37.643 and Wilk's lambda .843, and warm-hearted directiveness, which in the second step achieved F to enter value equal to 13.133 and Wilk's lambda 0.789.

Output 4 shows the percentage of the variance accounted for by the discriminant function, which is significant. Canonical correlation for a discriminant function is the proportion of the total variability explained by differences between groups. In this case 46% of variance is explained by between-group differences.

As shown in Output 5 presenting the structure matrix, the function is positively contributed by parental difficulties and negatively by warm-hearted directiveness.

Prediction of group membership using the discriminant function developed in the analysis indicates that the overall success rate is 71.1%. Output 6 shows that well-behaved children were the most accurately classified, 76.5% of the cases being correct. Badly-behaved children were classified with a success rate of 65.7%.

Output. 6 Classification results table showing predicted group membership

	Teacher's opinion	Predicted group membership		Total
		Well-behaved	Badly-behaved	
Count	Well-behaved	78	24	102
	Badly-behaved	35	67	102
	Well-behaved	76.5 %	23.5 %	100
	Badly-behaved	34.3 %	65.7 %	100

On the basis of the results it can be said that parental difficulty is the main variable that distinguishes the two groups of children (badly- and well-behaved). The second variable that distinguishes the groups is warm-hearted directiveness which is also negatively correlated with parental difficulty. The third variable is aggressive directiveness which is positively correlated with parental difficulty and negatively with warm-hearted directiveness.

The general results of the C&RT algorithm were similar, but the data mining method provided much more information about the arrangement of predictors to differentiate the groups. The algorithm yielded a lot of information on homogeneous groups that it differentiated using predictor variables. Discriminant analysis does not make a similar differentiation, it only shows which variables are important to differentiate between groups of people. The C&RT method far exceeds it in this regard.

Conclusions

Thanks to the discriminant analysis and data mining (classification and regression tree C&RT) methods, it was possible to discover that warm-hearted directiveness is the main feature which differentiates the well-behaved and the badly-behaved children's groups.

The C&RT method distinguishes more characteristics that can determine a child's behavior. Warm-hearted directiveness in both analyses was a significant predictor in assigning participants to the groups. Besides warm-hearted directiveness, experienced parental difficulty, aggressive directiveness and parental control were other predictors that could distinguish the badly-behaved children's group from the well-behaved children's group. In the C&RT model, warm-hearted directiveness had the largest node. It is the most useful predictor helping to distinguish between the groups. The significance of warm-hearted directiveness could also be seen in the discriminant analysis model, in which warm-hearted directiveness, together with experienced parental difficulty, predicted 76.5% of correct assignment of well-behaved children and 65.7% assignment of badly-behaved children. As a result, the two-variable accuracy of the discriminant analysis model was 71.1%. Although the accuracy of the model is not very high, it must be underlined that it results from only these two variables. Each of them has a significant ability to predict a child's behavior. Possessing knowledge of parental difficulty and the level of warm-hearted directiveness makes it possible to predict a child's behavior with 71.1% accuracy. C&RTs revealed that when the level of warm-hearted directiveness is lower than 94.5, the badly-behaved children's group is distinguished. However, the group achieved through this function is not homogeneous yet (as shown in Figure 5). Another function must be applied, and parental difficulty was used for this purpose. It permits the prediction that when a parent claims that he/she experiences difficulty with his/her child, the child's behavior at kindergarten is bad. In order to

achieve more homogeneous groups, the C&RTs counted two more functions: for aggressive directiveness and for parental control. Aggressive directiveness is the third variable that distinguishes between the groups. When its level is higher than 49.5 points on the scale, mathematical algorithms could find the function that separates the well-behaved children's group from the badly-behaved children's group. The last variable is parental control; when its level on the scale is higher than 9.5, the algorithms found the solution to distinguish between the groups.

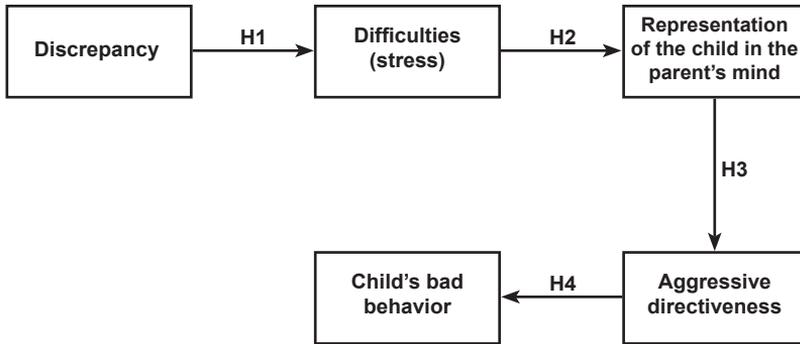
Summing up, we can say that parents of well-behaved children apply warm-hearted directiveness when they talk to their children; they also use parental control to cope with difficulties, which means that they explain the rules of social behavior to their children. On the other hand, parents of badly-behaved children apply aggressive directiveness or they mix aggressive directiveness with warm-hearted directiveness, and they also experience many problems in their relationships with their children.

Very important conclusions can be drawn from the canonical correlation analysis. It confirms the results revealed by data mining and discriminant analysis concerning badly-behaved children's parents. Canonical correlation revealed that, in the group of badly-behaved children's parents, aggressive directiveness is associated with the experience of parental difficulty. The stronger the difficulty the parent experiences, the higher the level of aggressive directiveness he/she applies toward the child. This means that parents strengthen aggressive directiveness when they experience difficulties, when they experience stress in the relationship with their children.

Quite a contrasting situation was discovered in the group of well-behaved children's parents (the result was also confirmed by the C&RT model). In this group, difficulty experienced by a parent in his/her relationship with a child is associated with parental control. The parent starts to teach the child the rules of social behavior when he/she experiences difficulties in the relationship with the child. Such parental behavior may explain the parents' success in the child's upbringing process. Even when such parents experience difficulties, they strengthen their teaching style rather than their aggressive communication. Even more interesting is the fact that the younger the child, the stronger the parental control. This is very wise as younger children do not know the rules of social behavior.

The last but still very important and interesting issue is the problem of model accuracy in data mining analysis. In the presented research, the model's accuracy is 75.65% and the testing error is 24.32%. The accuracy is adequate but still not very high. In the case of data mining algorithms, the model's accuracy often reaches levels of 95% and above. This, however, is a problematic rather than convenient situation for the researcher. The greatest danger in data mining is overfitting of the model rather than underestimation (Nisbet, 2009). This is due to the fact that mathematical algorithms try to fit the model until they find functions which help to achieve homogeneous groups. During this procedure, insignificant information

Figure 6. Theoretical model of a child’s difficult behavior as the consequence of a parent’s aggressive directiveness to the child



can fit as well. The researcher achieves a model with very high accuracy but one that is useless when applied to new data. This is due to the fact that a lot of noise was fitted to the model. The model presented in the article was good but not so good as to cast doubt on its credibility. The results were also confirmed by two statistical methods: canonical correlation and discriminant analysis.

Discussion

Experiencing difficulty is conceptualized in psychological theories as stress (Reykowski, 1966). On the basis of the C&RT method, it can be concluded that the more stressful the relationship with a child, the more probable it is that the child’s behavior at kindergarten is bad. How can this be explained? First, it should be understood that a child’s bad behavior concerns his/her attitude toward friends at kindergarten and toward the teachers. In the research, the child’s attitude to the parent was not controlled. There may be thousands of reasons why parents experience difficulties in the relationship with their child, one of which is perhaps that the child does not fulfill the parent’s expectations. Theories of psychological stress allow us to see the phenomenon in a better light. Experienced difficulty (stress) can be caused by a discrepancy between expectations and actuality (Reykowski, 1966; Kochańska, 1982). The greater the discrepancy, the greater the probability of the emergence of stress as a person cannot achieve his/her goals (Reeve, 2005). This relationship is shown in Figure 6 with the symbol H1. Due to the difficult experience, the person shapes the representation of the object which caused the stress (Reykowski, 1966). This relationship is presented as H2. The child may irritate the parent (because it does not fulfill his/her expectations), so

the parent uses aggressive directiveness (H3) and, as a consequence, the child's behavior at kindergarten deteriorates because the child also starts to experience stress (H4). Similarly to adults, children also bring their troubles to their place of work (kindergarten).

The analyses leave no doubt that parental communication style has a great impact on a child's behavior. The research was conducted on a Polish sample and the definition of directiveness was different from the definition proposed by John Ray. In Polish culture, however, the use of directiveness plays a significant role in a child's education.

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