

A Predictive Model for Parental Stress and Constraining a Child's Own Activity: Structural and Data Mining Approach

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Abstract

The aim of the study was to test a theoretical model which described the causes of constraining a child's activity. The study involved 319 parents of preschool children. The model was tested with the help of structural equations. Cluster analysis was used to check how many clusters, i.e. groups of individuals similar to one another (due to variables described in the model), exist in the population. An artificial neural network was used to construct a prediction model for constraining children's activity. The results revealed that the theoretical model cannot be rejected as incorrect. The cluster analysis results revealed the existence of four groups of people. The neural network had a good prediction on constraining the activity of children.

Keywords: Constraining a child's activity; Structural equation model; Cluster analysis; Artificial neural network

Introduction

Inhibiting, also known as constraining or restraining, the activity of a child has recently raised a great deal of interest among researchers. Several studies were carried out concerning this issue [1-3]. Over the past 20 years, increased legal activity has been registered to limit the restraining of children's activity. In 1997 restraining a child's activity was banned by law in the state of Georgia (USA) and few other states. In Poland in the 1990s, constraining children's activity was associated with a parental and educational mistake [4] and with the social inactivity of children [5,6]. Some authors predict that constraint of activity may also be associated with a decline in children's competence in the constrained areas [2] as research has confirmed. It turns out that constraining children's social activity is linked with the decline of social competence [3] and physical activity with increases of physical inactivity [1]. Very interesting comments were made by Barker who noticed that constraining children's activity is related to a disorganization of their activity children who are constrained experience problems when organizing a new activity. Constraining a child's activity may

produce negative associations with the constrained activity in that child and, consequently, may lead to the child's ceasing to make an effort to develop in a given area. As a result, it may involve creating a representation in that child of him or herself as of being incapable, which can lead to resigning from the activity and even may lead to primitivization of activities [7]. No studies so far have shown those constraining or restraining children's activity results in negligible effects on their development. All studies have revealed that these effects are negative. It seems, however, that it was not the results of scientific research that led to the social and legal movement of banning the restraining of children's activity but the tragic events that took place with their participation. There have been reports that children who were closed in rooms, where the space was restricted, for some longer periods of time and experienced repetitive episodes of having their activity inhibited, died [8,9]. Because the very phenomenon of restraining and constraining a child's activity and its potential causes are quite new to science, in this article we approximate: a) what restraining and constraining children's activity is, b) what types of restraining and constraining children's activity are distinguished and which of them are prohibited by law and c) what may be the reasons for constraining children's activity. The causes have already been largely described in the psychological sciences [4].

Constraining and restraining a child's activity

Inhibiting is not a uniform theoretical construct; therefore, it can be defined in many ways. If we were to use the universal definition of inhibiting we must quote Gurycka, who stated that inhibiting was as follows: Interrupting, banning the child's own activity through physical or symbolic behavior, changing without reasonable cause a child's activity. This is a universal definition because it can be used to determine any type of inhibiting a child's activity. The inhibition of children's activity in English-speaking cultures is described in two words, namely "restrain" and "constrain". Their use alone tells us what kind of activity the child is doing and what methods are used to inhibit the child. Restraining a child's activity refers to inhibiting the physical activity of children. This is done by binding children or closing

them in rooms. This type of restraining a child's activity has been banned legally in certain states of the United States.

Types of constraining a child's activity

When speaking of constraining the activity of a child we refer to the types of constraining activity and to the way in which it is constrained. The types of constraining children's activity comprise: a) constraint of manual activity, b) socio-relational, c) kinesthetic, d) musical, e) cognitive, etc. The methods of constraint include bans, criticism, ridiculing a child, humiliating him/her, and discouraging him/her from activity even with the use of force (as was mentioned above). To understand how fatal the effects of constraining a child's activity can be to the development of that child, let us look at the main areas of activity of pre-school children and the possible effects of constraining children's activity on their development in these areas. When conducting this analysis, it is important to remember that the child's own activity is the main force of its development.

The problem of ethics in research on constraining children's activity

Constraining a child's activity requires an analysis of the ethical aspects of this phenomenon. Some aspects of restraining have been banned legally; others, as research has revealed, have shown that they harm the child's development [1]. We found no studies which would show that constraining a child's activity would be at least neutral not have any effect on the child's development, and no research showing that constraint is conducive to the child's development. We therefore need to consider classifying constraining a child's activity to the category of parental mistakes, which the classification proposes [4]. According to Gurycka, parental mistakes are such behaviors on behalf of the parents that have a negative impact on the child's development. These include all parental situations that harm the development of the child. An essential is condition sine qua non included in the definition of mistake, which makes it possible to state that a situation unfavorable for the development of the child has occurred. This condition is the negative experience of the child, which will adversely affect his/her development.

The alternative to constraining a child's activity

Gurycka pointed to behaviors which may be an alternative to constraining children's activity. These behaviors are not associated with the increased likelihood of a mistake but, on the contrary, may have positive effects on the child's development. Gurycka termed these behaviors as directioning the children's activity. They are defined as creating conditions for the development of the child's own activity; agreeing on a substitutionary activity with the child negotiating. Directioning the child's activity is behavior on the part of the parent which creates situations that direct the child's activity and does not constrain it. To understand how directioning the child's activity solves the problem while not constraining the child's activity, let us assume a situation in which the child paints with paint on the wall. Constraining the child's activity will mean prohibiting the child from doing the activity, while the directioning the child's

activity to find an alternative activity that will allow the child to continue acting in a socially acceptable manner. Directioning the child's activity may in this case be the child's desire to paint at an easel. However, a parent that directs the child's activity must take into account the fact that a child painting on the wall only appears to be practicing the same skills that he/she would be practicing on a piece of paper placed horizontally, hence directioning the child's activity is not easy at all. Proper directioning of the child's activity requires some knowledge about the importance of a concrete activity for the child's development. Withholding the paint and not allowing the child to play is the simplest solution, although in the long run it is the most important solution in its consequences as it can slow down the child's development.

Causes of constraining a child's activity

According to Winterhoff, the main reason for constraining a child's activity is consent, i.e. social consent to allow for constraining children [3]. This consent to constrain the child's activity may be conditioned by several reasons:

- Undervaluing the importance of the child's own activity for its development as the main motivating force for this development.
- Recognizing that a child's activity is not as important as the parent's activity.
- Thinking that the parent knows better as to what is good for the child's development, which gives the parent the right to interrupt, criticize, replace, change, and impose other activities.

As Hickman notes constraining signals the priority of curriculum over children's well-being and lack of trust in children and their self-regulating competencies. Research conducted on the Polish sample seems to confirm the above findings to some extent. Both studies on constraining a child's activity that were conducted in 1989 Szymańska's, Aranowska's, and Torebko's research show that parents do not notice how much they constrain the activity of children. In parent-child pairs, parents claimed that they rarely constrained the activity of their children, whereas their children, after aggression, identified constraint as the most common phenomenon [10].

Model of constraining the activity of a child reconstructed on the basis of Gurycka's theory

The theoretical model was reconstructed on the basis of Gurycka's theory. Since Gurycka's theory is structural in nature, the model reconstructed on its basis contained variables arranged in a network of interrelations conditioned in a causal way, where subsequent variables are mutually determined. This model is shown in **Figure 1**.

The discrepancy between the parental goal and the level of development of the child in terms of the developing characteristics determines the experience of parental difficulties, and this is the first relation in the model and the hypothesis, designated as H1 in **Figure 1**.

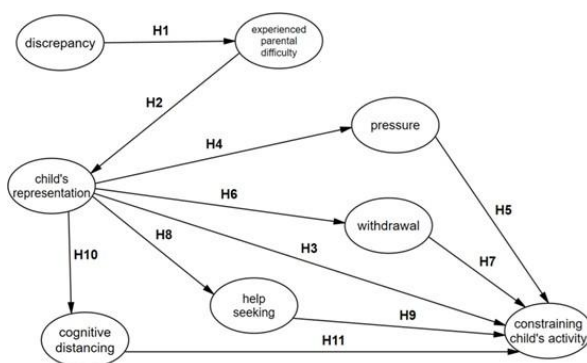


Figure 1: Theoretical model reconstructed based on Gurycka's theory.

Materials and Methods

Ethics committee approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The research study received the approval of the Ethics Committee of the Faculty of Psychology, Warsaw University on January 12, 2010.

Purpose of the research

The purpose of the research was to:

- Reconstruct and successively test the model presented in **Figure 1**. For this purpose, structural equations were used to test the model reconstructed on the basis of Gurycka's theory [11-16].
- Test the most common profiles of people similar groups highlighted in the population because of a similarity in the results of variables that were entered into the model people who have similar results in variables were assigned to the same profile. Cluster analysis conducted by data mining algorithms Generalised Cluster Analysis k-means was used for this purpose [11].
- To see how much, on the basis of variables included in the model **Figure 1**, a prediction can be made concerning the results of parents in constraining the child's own activities. This was done on the basis of knowledge about the results of people in terms of variables which, according to Gurycka, may determine the constraining of a child's activity. An artificial neural network was used for this purpose which, by means of the "learning with the teacher" method, generated rules and made predictions [3].

Participants and procedure

The study was conducted online on the territory of Poland. Questionnaire was posted on a website for parents. The study sample was random. The sampling frame was a list of preschools provided by the Ministry of Education in Poland. The interval draw was constant $k=6$. Preschools representing all voivodeships

and provinces in Poland were drawn, proportionally for the largest provinces. Randomly selected preschools were contacted via email, and preschool directors were asked to inform parents about the research. A large portion of people invited to the study refused to participate. Those who did agree to take part in the study acquainted themselves with detailed information on how the testing would be done on the website. At the beginning of the study the parents were asked to think about their child, i.e. the one that was attending preschool, and to answer questions pertaining only to that child until the end of the study. This procedure protected against a crisscross of responses if the parent had more than one child. The study involved 319 participants-both the fathers and mothers of the preschoolers.

Measurement tools

Since no psychological instruments measuring the tested variables exist it was necessary to construct such instruments. The instruments and their psychometric properties were described by Szymańska and Dobrenko. Below we describe general information about tools. Discrepancy Scale measures the distance between parental goals the psychological traits which the parent wants to shape in the child in the course of the parenting process [11-15] and the child's current state, i.e. the degree to which the child has developed a desired characteristic [2]. Discrepancy is the result of the observation of differences and has a purely cognitive character. It was measured by means of the Discrepancy scale.

Results

Calculations of the estimators in the one-level Structural Equation Model (SEM)

The theoretical model was tested by means of structural equations modeling. The degrees of freedom were freed in such a way that only relations provided at the theoretical level were left **Figure 1**. Four parts of the model were used to accurately estimate the relations between the variables. The simultaneous introduction of all variables to the model would lead to co-correlation of variables and prevent the estimation of the exact level of relations between them. Therefore, each model tested the mediating role between one stress response and the representation and constraint of a child's activity. The results of the models are shown in the graphs presenting the standardized results. It must be stated that as a result of the formation of a representation of the child and the fact that the child's tasks are less important than the activities of the parent, the parent adopts combating the stress reaction by applying pressure to the child and defends him/herself against stress by withdrawal. However, parents do not adopt combating stress reactions which involve searching for help or distancing themselves from the situation. Parents constrain a child's activity as a result of representation and combating stress by pressure and withdrawal from the situation. The more parents apply cognitive distancing, the less they apply constraining a child's activity.

Cluster analysis

The results of cluster analysis revealed that there are four clusters in the set. The first profile, which is the least frequently represented in the population, comprises 18% of the sample tested (**Table 1**), i.e. those who had the highest values in terms of discrepancies, experienced difficulties, children's representation, withdrawal, and constraining of children's activity. This group also has some of the highest scores in terms of pressure. Persons with this profile used cognitive distancing the least often as a reaction to stress. The profile analysis provided new and valuable information. Approximately 54% of Polish parents does not experience the inability to meet educational goals; therefore, they do not experience difficulties and are not exposed to parental stress. About 27% of parents have a moderate level of difficulty in achieving their parental goals, and in this situation, they are characterized by a fairly diverse response to stress, including pressure, seeking help, and cognitive distancing. About 18% of parents, however, are exposed to higher stress in the parental situation due to the impossibility of achieving their parental goals. The profiling analysis also revealed that the greatest chance of obtaining positive reactions to stress, such as cognitive distancing or seeking help, occurs at low levels of stress. When stress increases, less positive forms of stress coping, such as pressure and withdrawal, also occur. With high levels of difficulty, unfavorable forms of stress coping continue to strengthen while positive forms such as distancing and seeking help become weaker.

	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Discrepancy	128.291139	121.231884	244.164706	468.28
Difficulty	13.6329114	9.52173913	30.5411765	63.48
Representat ion	12.164557	9.33333333	21.6117647	33.48
Help seeking	22.9620253	8.50724638	15.0588235	15.76
Distancing	25.3164557	24.7681159	19.3058824	11
Pressure	5.70886076	4.79710145	15.1882353	15.96
Withdrawal	4.08860759	3	14.3294118	30.44
Constrainin g	29.164557	29.3478261	60,11,76,47 1	96.6
Number of cases	79	69	85	25
Percent (%)	30.620155	26.744186	32.9457364	9.68992248

Table 1: Number of cases classified in clusters.

Artificial neural network

A total of 200 neural networks were built, of which one of the best trained networks was selected. The network had 7 inputs, 9 neurons in the hidden layer, and 1 neuron in the output layer, and was therefore labeled as MLP 7-9-1. The input data for the network were Discrepancy, Experienced Difficulties in the Parental Situation, and Child's Representation in the Parent's

Mind, Applying Pressure, Withdrawal, Seeking Help, and Cognitive Distancing. In the learning process the patterns were divided into 3 separate sets, namely the learning set, which represented 70% of the sample, testing (15%), and validating (15%). In other words, the data set is divided into three subsets. There were 223 participants in the teaching set, which constituted 70% of the sample. There were 48 people in the test set, which accounted for 15% of the sample. There were 48 participants in the validation set, which constituted 15% of the sample. The learning set was used to teach the network and the test set was used by the network to test its predictions while learning. The validation set was not shown to the network while learning. In other words, it reveals the correctness of predicting each person's outcome in the set its result in constraining the activity of the child based on the input variables the person's results for constraining. The degree of validity of the network was determined based on the validity of forecasting for the validation set. The higher the correlation coefficient of the predicted network with real data, the better the network was evaluated. It shows a predictive sheet presenting exemplary results for 10 people in the variables range: discrepancy, difficulty experienced, representation, applied pressure, withdrawal, and output variable as constraining the child's own activity constraining input.

Interpretation of results

The results of the study revealed the relevance of observations that were made by Gurycka regarding the causes of constraining the activity of children. First, all of the variables in the model reconstructed on the basis of her theory were related at a high and moderate level, which was shown by the structural equation model. These variables, arranged in such a path as Gurycka pointed out, explained well the constraining of a child's activity. The model extended by three variables of reaction to stress, i.e. a) retraction, b) cognitive distancing, and c) seeking help, also revealed that constraining the child's activity is associated with parental withdrawal from the parenting situation. But most strongly of all variables constraining the activity of the child is explained by the representation of the child and his activity as less important than the activity of the parent. It is very important to note that the research confirms Gurycka's and Wintehoff's findings. Cluster analysis revealed that at least 4 profiles of people with similar characteristics exist in the Polish population within the scope of the variables discussed in the model. The results of the neural networks revealed that, based on the results of people in the variables conditioning constraining the activity of children, real results in constraining the activity of children can be predicted with quite good validity. This result is considered to be extremely important, as artificial neural networks are predictive methods and their solution determines how true based on the variables indicated in the models a forecast can be made, although we know that artificial neural networks, despite their powerful learning opportunities, are not always able to carry out such precise predictions. In the case of random numbers even the best neural network will not succeed in prediction [5-7]. The fact that the neural network can predict the results of people in

constraining the activity of their children is a success of this model and above all of Gurycka's theory.

Discussion

The presented model reconstructed on the basis of Gurycka's theory on the high level explains the constraining of the activity of the children. A representation of the child's tasks and activities as less important than the parent's activity and tasks and the use of pressure and withdrawal as a response to stress explain high and moderate constraining of children's activity. We know, however, that this is just one of the possible explanatory models of the reason for constraining a child's activity.

Constraining a child's activity in the face of the impossibility of achieving parental goals may, of course, be conditioned by factors other than parental difficulty. These factors and circumstances should be sought, which is serious and seems to be quite a new challenge in psychology. The model we reconstructed and tested, although not the only one possible, has a high methodological status because it was based on a theory, i.e. it was not an empirical model whose verification value would be nonexistent. The status of this model would certainly be even greater if the study was of a longitudinal nature, and the relations in the model in the causal category could be tested. But even this model verified in cross-sectional studies proves probable causal relations predicted at the theoretical level.

The most significant limitation of this model is that it does not take into account the effects of constraining a child's activity. The probable impact we predicted at the theoretical level of constraining among pre-school children is related to the decline of children's competence in the constrained areas. The relationships we envisioned and described have unfortunately never been empirically verified for application reasons [3-5]. This task should be undertaken in the future. If our assumptions were correct, they would support the validity of Carver and Winterhoff's results. Constraining children's activity can have one more, very dangerous impact on the development of children. Studies have shown that children's social passivity can be triggered by constraining their activity. As modern research shows, constraining children's activity varies from age to age. Constraining the activity of children 20 years ago was different than now; therefore, in modern research it is necessary to check whether constraining still, as it did in the past, causes social passivity. It may turn out that it does not. On the other hand, it may turn out that it affects spheres of development that have not yet been taken into account, and ones that were so far unforeseen. Why is this so? Because constraining a child's activity is diverse and unstable in the historical context. Our interviews with experienced pedagogical specialists with forty and more years of experience who observed daily interactions between parents and children revealed that the constraining of children's activity that is applied now was done differently 20 years ago. Today, in an age of globalization, with increased access to the Internet, requirements imposed on parents and increasing social awareness of the rights of the child, constraining children's activity takes place in lobbies. In the past the parent would directly say to the child: You are not allowed to

do so and so. Today it is observed that parents rarely say to their children directly what they are and are not allowed to do. On the contrary, they allow their children to do many things and do not prohibit them from doing things, while constraining takes on the form of very strong criticism if the child's activity causes any damage. We are therefore observing a change in the way that children's activity is being constrained. Children's activities are not interrupted as often as they used to be, but children are often criticized and humiliated for their activity. This can definitely affect the way they develop, perhaps not so much in terms of their social passivity but, for example, in terms of their self-esteem.

Conclusion

In conclusion, it should be noted that the formed latent variables showed very good reliability along with the percentage of variance extracted. Apart from the latent variable of the representation of the child, the reliability and percentage of variance extracted for the other variables had very good psychometric parameters. The model presented here has many degrees of freedom. This means that it is complex in the sense that it has many free parameters, not calculated. The value of the most important fit statistic RMSEA (<0.08) indicates that the model fits the data well. The value of the test was, and thus the measurement model can be considered as fitting the data well. The value of CFI, which is slightly lower than 9, also shows that the model fits the data well.

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