

Effects of Parental Acceptance-Rejection, Psychological Adjustment, Academic Self-Concept, and Learning Motivation on Adolescents' Academic Achievement.

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Abstract

The present study tested whether a set of variables in a hypothesized model derived from Interpersonal Acceptance-Rejection Theory influence academic achievement. More specifically, the study examined the extent to which perceived parental acceptance/rejection [2] contributed to academic performance of Portuguese teenage students. Additionally, the study tested the mediating role of certain variables, namely psychological adjustment [2], academic self-concept [38,39], and motivation for learning [7]. Path analysis revealed that perceived parental acceptance/rejection influenced psychological adjustment; in sum, it supports the significance of the direct effect relationship established between perceived maternal and paternal acceptance/rejection and psychological adjustment/maladjustment of the children. Furthermore, students' psychological adjustment influenced their academic self-concept and academic self-concept influenced both the motivation for learning and students' academic performance.

Keywords: academic achievement; parental acceptance/rejection; psychological adjustment; academic self-concept; motivation for learning

Introduction

Academic achievement is a major concern for societies, with students who are well succeed at studies having best opportunities of job and social mobility. There are plenty of aspects that can impact on students' academic achievement. Surely, one of them is the perception of the emotional relationship established with parents.

Concerning the connection between parental acceptance/rejection, mother and father, and the academic performance of the children, two

fundamental conclusions are drawn. One is based on the fact that when children feel, at least one parent as acceptant, they tend to achieve more school success. Another suggestion is that the perception of maternal acceptance/rejection as the one that most demonstrated to contribute to the academic performance of the students [1].

Based on the finding of some hypotheses that were confirmed in the meta-analyzed studies, [1] proposes a hypothetical conceptual model, whose relations presented may suggest and inspire authors to direct future research. This theoretical model is presented below:

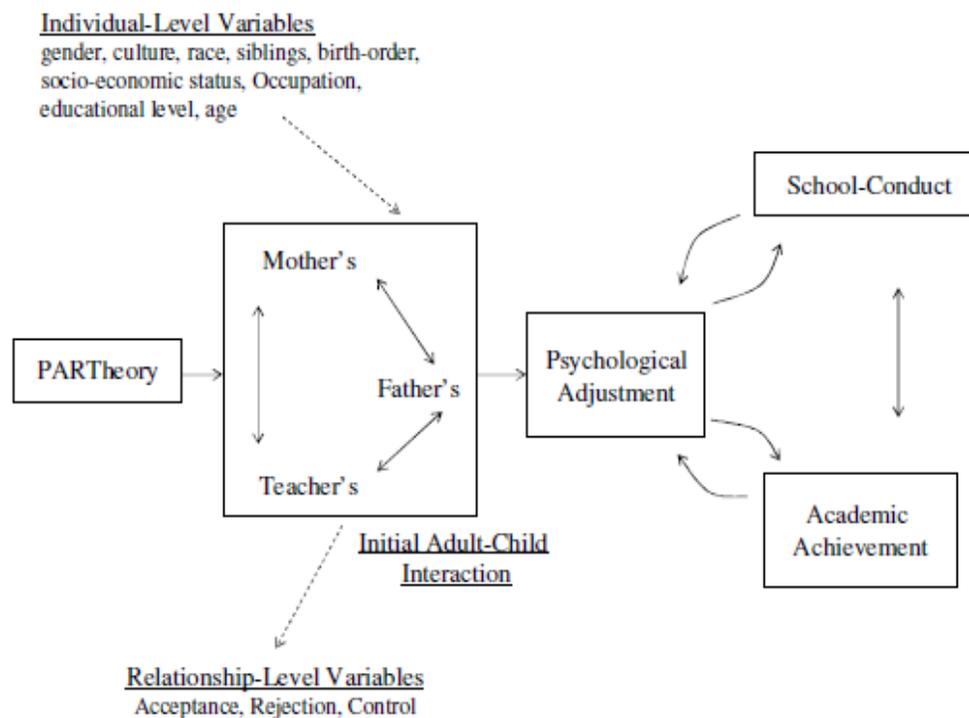


Figure 1. Preliminary conceptual model and suggestions for research from [1]

It suggests a starting point for the understanding of effects originated by the presented variables, among themselves. As a product of the results that may arise in the future - originated by the research suggestions-, the author warns that some of the variables presented in the model may be discarded, as a result of the evidence. On the other hand, other variables may be added to the model, according to the same principle. It should be noted that the directions of the relations between variables can also be changed, depending on the future research to elucidate [1].

It is also important to add that national and international literature has been exploring the association between academic performance and perceived acceptance/rejection by teachers and the peer group. Despite the undeniable relevance of these studies, this factor has probably taken some focus away from the research about the impact of parental acceptance / rejection on students' academic performance so it becomes important to invest in it so that more conclusions can be drawn.

For the students' academic achievement it has been considered the contribution of their levels of psychological well-being. The worldwide most studied impact of parental acceptance/rejection is on psychological adjustment [53, 54]. We can find numerous studies affirming the positive impact of high levels of psychological well-being on the students' academic performance [21, 22 23, 61]. Another relevant variable in the educational research panorama is the academic self-concept and students' motivation for learning. Students with a higher academic self-concept tend to achieve better academic achievement and higher school grades [49] Research in the field of intrinsic motivation has demonstrated its association with better learning outcomes, compared to extrinsic motivation (Boruchovitch et al., 2010). Extrinsic motivation demonstrates to be correlated, in a significant and negative way, with school performance [32]

Beyond the fact that parental acceptance/rejection, psychological adjustment, academic self-concept and motivation for learning may impact students' academic achievement, we pretend to analyze relations between parental acceptance/rejection, psychological adjustment, academic self-concept and motivation for learning.

According to the literature review, the interactions that children establish with significant others, namely with parents, play also an important role for the psychological adjustment of children and for the development of aspects such as academic self-concept [19] and motivation for learning [11].

Considering psychological adjustment of students, in some studies it arises as an important correlate of self-concept. Numerous articles highlight the negative and significant association between factors such as externalization problems - which translate into behavioral problems, and academic self-concept. Higher indexes of psychological and social adjustment are positively related to academic self-concept [5].

Yet in relation to psychological well-being, some studies reported that different manifestations of psychopathology in adolescence may be associated with dysfunctions in one or more self-regulation mechanisms [57]

In concern to academic self-concept, several researches underline the relevant role of perceived competence in relation to intrinsic motivation [20] Students with a higher academic self-concept will be able, more easily, to set personal goals for their lives, as well as to develop the self-determination necessary to pursue them, always at their own will [7].

Authors Guay, Ratelle, Roy, and Litalien (2010) have found results indicating autonomous motivation for learning as a process that explains

how academic self-concept relates to students' school performance, revealed the autonomous motivation for learning as a mediating variable in the relationship between academic self-concept and school performance.

Hypothetical model and Hypothesis:

In this research, it was fundamental to test a model in line with the studies elaborated by several well-known authors such as [51] and [1] in that they emphasize the relevant role of parental acceptance/rejection in several outcomes obtained by subjects, in which psychological adjustment and academic performance fit in.

It was also considered possible mediating variables regarding the

association established between parental acceptance / rejection perception and academic performance, such as motivation for learning [7] and academic self-concept, [38] This was due, among other factors, to the fact that the motivation for learning and academic self-concept are widely related in the literature, either with the perception of the quality of parental relationships; psychological well-being indexes, and also with academic performance.

The elaboration of this model allowed us to interrelate the conceptual core of three distinct theories but, we believe complementary: [8].

The hypothetical elaborated model that will be analyzed for its probabilistic relevance is presented below (Figure 2).

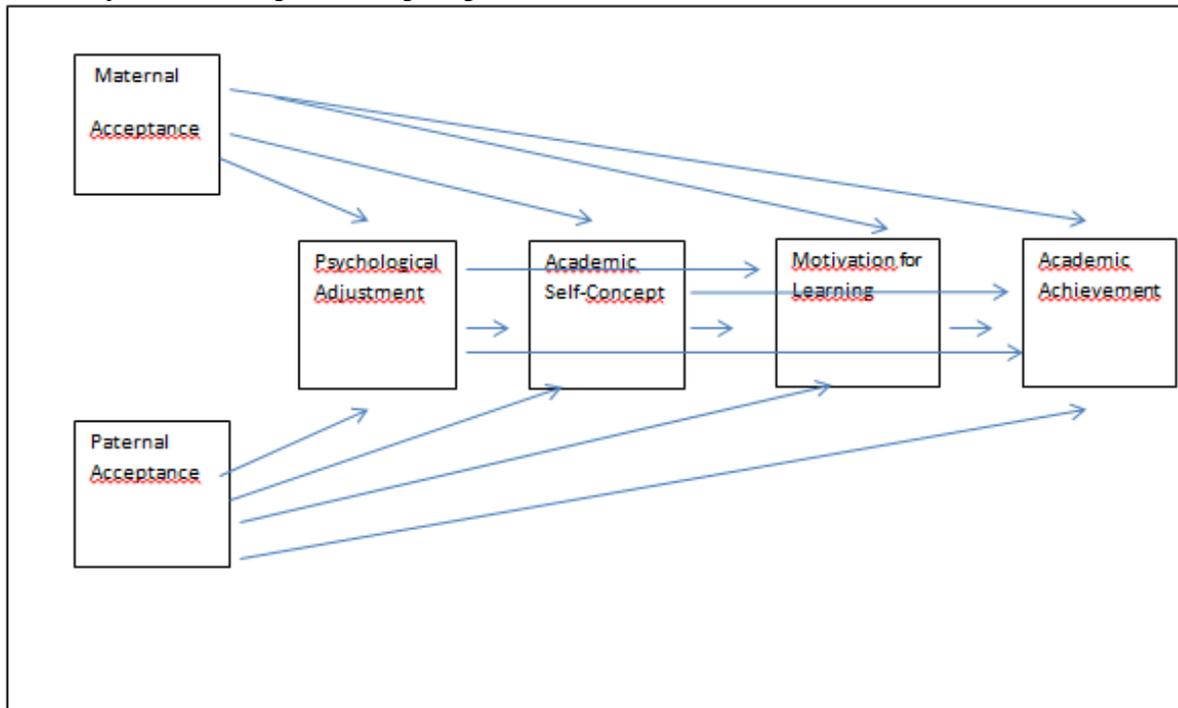


Figure 2. Hypothetical Model

Hypothesis 1	Perception of Parental Acceptance/Rejection, father and mother, is a significant predictor of psychological adjustment.
Hypothesis 2	Perception of Parental Acceptance/Rejection, father and mother, is a significant predictor of academic self-concept.
Hypothesis 3	Perception of Parental Acceptance/Rejection, father and mother, is a significant predictor of motivation for learning.
Hypothesis 4	Perception of Parental Acceptance/Rejection, father and mother, is a significant predictor of academic performance.
Hypothesis 5	Psychological adjustment is a significant predictor of academic self-concept.
Hypothesis 6	Psychological adjustment is a significant predictor of motivation for learning.
Hypothesis 7	Psychological adjustment is a significant predictor of academic achievement.
Hypothesis 8	Academic Self-Concept is a significant predictor of motivation for learning.
Hypothesis 9	Students' academic self-concept contributes to their academic achievement.
Hypothesis 10	Motivation for Learning is a significant predictor of academic achievement.

Table 1. Description of the hypothesis for research

Method

	Frequency	%	
Schoolar year	7º ano	214	37.3
	8º ano	202	35.3
	9º ano	157	27.4
	Total	573	100.0
Gender	Female	257	44.9
	Male	316	55.1
	Total	573	100.0
Age	12-13 years	246	42.9
	14-15 years	242	42.2
	16-17 years	79	13.8
	> = 18 years	6	1.0
	Total	573	100.0
		M = 13.95	D.P. = 1.46
		Min =12.0	Max = 21.0

The study involved 573 students, 257 girls (45%) and 316 boys (55%). The students in our sample are integrated in the third cycle of schooling (7º,8º,9º academic year), with ages between 12 and >18 years.

Table 2. Sample characteristics

		Frequency	%
Academic result at math	1*	17	3.0
	2*	196	34.2
	3	241	42.1
	4	91	15.9
	5	28	4.9
	Total	573	100.0
Academic result at mother language (Portuguese)	1*	6	1.0
	2*	115	20.1
	3	321	56.0
	4	115	20.1
	5	16	2.8
	Total	573	100.0
		573	100.0
		M = 1.79	D.P. =0.82
		Min =1	Max=4

*negative grades given by teachers.

There were more students who obtained positive grades at math (62.9%) and maternal language (78.9%) – Portuguese, than those who obtained negative levels at both disciplines, Math (37.1%) and Portuguese (21.1%).

Table 3. Sample's characterization: academic results

Measures

Parental Acceptance Rejection Questionnaire (Child PARQ).

It intends to evaluate the perception of the child/adolescent about the level of maternal and paternal rejection. Each of the scales comprises four subscales corresponding to the dimensions of parental behavior from which children tend to organize their parental acceptance/rejection perceptions: a) Warmth b) Hostility/Aggression, c) Indifference / Neglect, and d) Undifferentiated Rejection. These are self-response scales and their quotation is made through a *likert* scale of 4 points: a) often true, b) sometimes true, c) rarely true, and d) never true. The total scale score reflects the level of perceived parental rejection, ranging from a minimum of 24 (no perceived rejection) to a maximum of 96 (high perceived

rejection). The modal point is 56 points, concluding from this the predominance of perceived rejection [5]

Personality Assessment Questionnaire (Child PAQ).

It intends to evaluate the perception of the child and the adolescent in relation to seven dimensions of the personality associated to the psychological maladjustment: 1) Hostility and aggression; 2) Dependency; 3) Negative self-esteem; 4) Negative self-adequacy ; 5) Emotional irresponsiveness; 6) Emotional instability; 7) Negative view of the world or negativism. The answers follow a 4-point Likert scale: 1) Never True, 2) Rarely True, 3) Sometimes True, and 4) Often True, with the total scale translating the level of psychological maladjustment, between the minimum of 42 (good psychological adjustment) and the maximum of 168 (psychological maladjustment). The modal point from

which one considers the existence of a significant level of psychological maladjustment is the value of 105 [55]

Self-Regulation Questionnaire, Forma A (SRQ-A).

This questionnaire is concerned with the reasons that lead the subjects to perform their school work. Four questions are asked of children. The answers for each of the 32 items oscillate on a 4-point scale and represent the four regulatory styles used in the scale (external regulation, introjected regulation, identified regulation and intrinsic regulation). The validation of the scale presents values considered adequate [57, 58, and 59] finally, it should be noted that it is possible, through the scores of the subscales, to form a relative autonomy index. The control subscales are weighted negatively and the subscales associated with the autonomy are weighted positively.

Academic Self-Concept Dimensions.

The academic self-concept will be evaluated based on two dimensions (Auto concept to the mother tongue and mathematical self-concept) created by [47] with the objective of being included in a self-concept scale [46] based on Harter scales but with a different format (a single statement instead of the two used in those). In each item a particular type of young person is described, and the respondent should indicate the option that corresponds to him or her on a four-point scale, ranging from "Completely different from me" to "Exactly like me". Each item is quoted from 1 to 4 (with the score 1 meaning low perceived competence and the high perceived competence score 4), then the average for each dimension of the scale is calculated. In a study by [47] the internal consistency for each of the subscales varied between 0.74 and 0.88.

Academic Achievement.

Data regarding academic achievement is regard to the academic grades at math and maternal language – portuguese-, provided by teachers in relation to the 2nd period of the school year.

Procedure

The first step was getting the authorization to collect data from the Data Protection Commission, the Directors of the schools involved and the students' legal representative. The collection was done in a classroom and collective environment.

Results

In the analysis performed on the hypothetical model formulated for this study, we considered some relationships among different variables such as academic achievement, parental acceptance/rejection, psychological adjustment/maladjustment, academic self-concept and motivation for learning.

At first, the hypothesized model was tested taking into account some relationships which had already been reported in the literature. An analysis of paths/trajectories was made using AMOS 4.01. The Path Analysis is used to study structural relations (direct and indirect effects) between the manifested variables, from the correlation structure between them. Structural relations that reflect causal hypotheses about the direct and indirect effects of manifest variables are particularly appropriate to test hypotheses of mediation between variables [36, 37]. The validation of the structural model was based on the methodology of Structural Equation Modeling (SEM), using AMOS software (version 22, SPSS Inc., Chicago, IL).

The method used to estimate the unknown parameters of the different trajectories of the model was the maximum likelihood, which provided the estimates of standardized trajectory coefficients, standard deviation, Z-statistic (critical ratio) and p-value (values of $p < .05$ were considered indicative of significant trajectories).

The adjustment of the model was evaluated through the adjustment indices X^2 / df , CFI, GFI, TLI and RMSEA. The model that was designed in AMOS portrayed all the trajectories contemplated in the hypotheses.

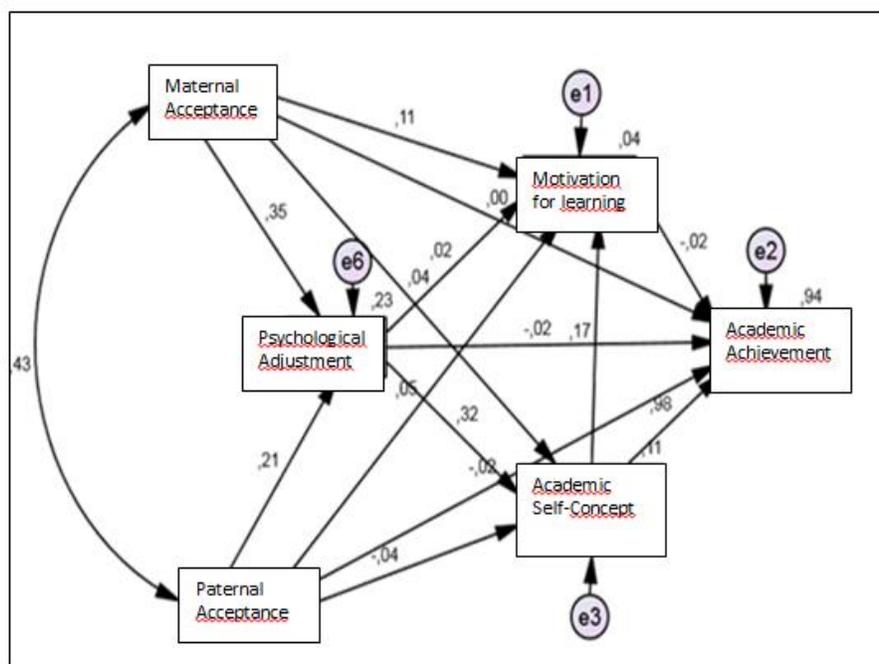


Figure 3. Tested hypothetical model

The results obtained showed that the theoretical model tested was not adjusted, the RMSEA of .471 shows an unacceptable adjustment and the X^2 / df of 27.643 and the GFI = .633 a bad adjustment. Then, the trajectories related to each hypothesis were analyzed by analyzing the significance and estimation of the relation.

No	Predictor Variable	Outcome Variable	Beta	SE	CR	p
1.	Maternal Acceptance	Psychological Adjustment	.350	.276	8.619	***
2.	Paternal Acceptance	Psychological Adjustment	.210	.223	5.183	***
3.	Paternal Acceptance	Academic Self-concept	-.044	.117	-.983	.326
4.	Maternal Acceptance	Academic Self-concept	.037	.151	.792	.428
5.	Psychological Adjustment	Academic Self-concept	.323	.021	7.184	***
6.	Paternal Acceptance	Motivation for learning	.048	.223	1.031	.303
7.	Psychological Adjustment	Motivation for learning	.019	.043	.385	.700
8.	Academic Self-Concept	Motivation for learning	.171	.080	3.938	***
9.	Maternal Acceptance	Motivation for learning	.115	.288	-2.373	.018
10.	Motivation for learning	Academic Achievement	-.021	.002	-1.916	.055
11.	Academic self-concept	Academic Achievement	.977	.004	85.530	***
12.	Psychological Adjustment	Academic Achievement	-.015	.002	-1.188	.235
13.	Maternal Acceptance	Academic Achievement	-.004	.015	-.310	.757
14.	Paternal Acceptance	Academic Achievement	-.017	.012	-1.389	.165

*** $p < .001$

Table 4. Path Analysis Results

Observing the trajectories related to the hypotheses, it is verified that hypothesis 1 is confirmed: The perception of parental acceptance/rejection concerning to mother and father is a predictor of psychological adjustment (H1, $\beta = .350$, $p = .000$; H1, $\beta = .210$, $p = .000$), showing a positive relation with this variable. However, we underline the fact that the perception of parental acceptance/rejection has revealed lower values than those of maternal acceptance.

Perception of maternal acceptance/rejection is also a predictor of motivation for learning, thus confirming, partially, hypothesis 3, (H3: $\beta = .115$, $p = .018$), since for the father the hypothesis was not confirmed due to the non-significance of the relationship.

Beyond the undeniable importance of psychological well-being as an indispensable variable for the holistic development of the subject, it is also important to highlight the reasons that may lead to the (in) success of the students.

Parental rejection has been associated in the literature with several negative consequences, within which to achieve academic failure [1].

Regarding the effect of parental acceptance/rejection on academic performance, it was revealed that there is no direct relationship between these factors, thus rejecting the H4 hypothesis. This effect has therefore proved to be of an indirect order, as indeed has been verified.

In relation to the relations of influence between the variables, it can be said that parental acceptance / rejection perception directly influences the students' psychological adjustment and, indirectly, their academic performance [1].

By placing academic performance in a prominent position, as the last variable, it can be seen that psychological adjustment only had a direct effect on self-concept, not performance.

Hypothesis 5 is also confirmed, psychological adjustment is a significant predictor of academic self-concept, with the positive relation (H5: $\beta = .323$, $p = .000$). Academic self-concept was also a predictor of academic performance, confirming hypothesis 9 (H9: $\beta = 0.004$, $p = .000$).

In addition, it is emphasized, as regards the state of the art of academic self-concept, its associated with academic performance and also with other variables related with learning (e.g., motivation for learning).

Thus, hypotheses 8 and 9 were also confirmed, revealing the academic self-concept variable as a predictor of the variable related to learning motivation (H8, $\beta = .171$, $p = .000$) and academic performance (H9: $\beta = .977$, $p = .000$). Thus, the existence of a positive and significant effect of the self-concept on the motivation for the students' learning was verified.

It is emphasized that academic self-concept has a very strong relationship with academic performance and was also the only variable with direct predictive effect (in relation to academic achievement).

The main objective was to test, statistically, the adjustment of a conceptual model elaborated in this study, based on the literature of the specialty that was being collected and consulted, over time. The elaborated model was hypothesized based on the relationships established among self-perceived variables such as acceptance perception, parental rejection; the psychological adjustment, the academic self-concept, the motivation for learning and the academic performance already mentioned in this research. Since the model did not reveal with adequate adjustment, a new model was elaborated, this one to be adjusted properly, constituting like the final model.

Proceeding to the corresponding changes to the model, to remove trajectories that were not significant, we obtained a model with good adjustment (Figure 5).

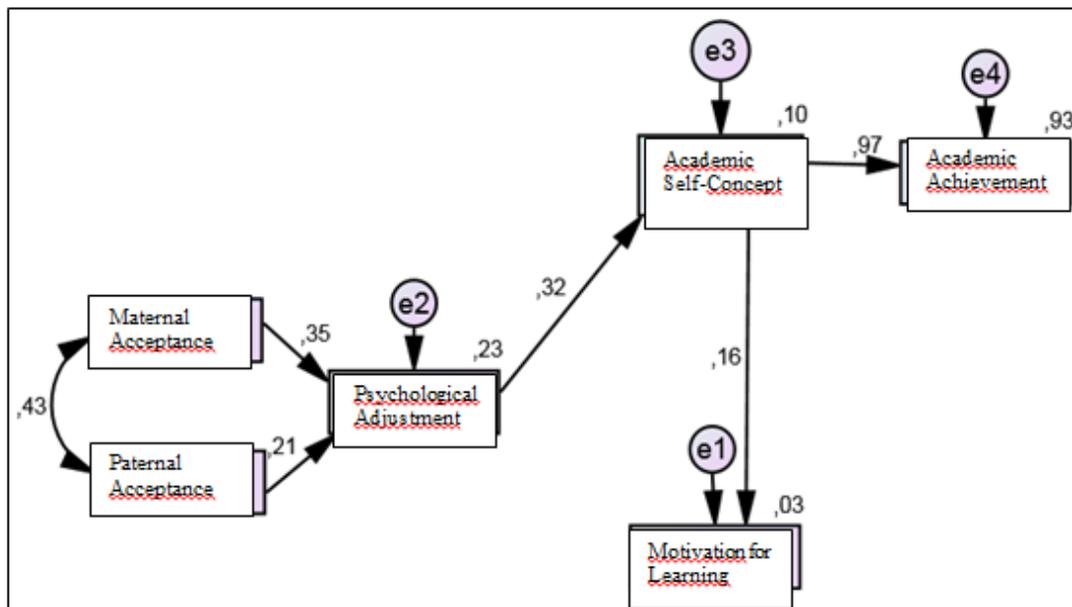


Figure 5. Second hypothetical model tested

In this last model, a good adjustment was observed (Table 4). The adjustment measures used show a good fit ($X^2 / df = 1.910$) or very good (CFI = .996, GFI = .990, TLI = .993, RMSEA = .040).

Measures of adjustment	Values
X^2 / df	$X^2/df = 1.910$
CFI	CFI = .996
GFI	GFI = .990
TLI	TLI = .993
RMSEA	RMSEA = .040

Indirect Effects of variables on academic achievement

We used the SPSS Amos 25 software to perform the Monte Carlo simulation to estimate the standard errors and significance of the indirect effects by Bootstrap resampling (Marôco 2010), using a 95% confidence interval. This method presents high precision.

Table 4. Significance of the mediation effects by Bootstrap resampling.

	Paternal Acceptance	Maternal Acceptance	Psychological Adjustment
Academic Achievement – Standardized indirect effects	.063	.131	.055
Academic Achievement – Standardized indirect effects IC 95% inferior limit	.042	.099	.046
Academic Achievement - Standardized indirect effects – IC95% superior limit	.090	.167	.067
Academic Achievement – Significance value	.006	.007	.005

Table 5. Final Model: Measures of Adjustment

The indirect effect of the paternal acceptance variable in academic performance is: .063 [95% CI: .042, .090], $p = .006$. The zero is not present in the confidence interval and the value of the significance is inferior to .05. By this, it is considered the existence of an indirect effect of the perception of the paternal acceptance in the academic performance.

The indirect effect of the variable "Maternal acceptance" in the academic grades is: .131 [95% CI: .099, .167], $p = .007$. The zero is not present in the confidence interval and the value of significance is less than .05. The results point out the existence of an indirect effect of the perception of maternal acceptance in academic performance.

The indirect effect of the variable "Psychological adjustment" on academic performance is: .055 [95% CI: .046, .067], $p = .005$. Zero is not present in the confidence interval and the value of significance is less than .05. The results point out the existence of an indirect effect of psychological adjustment in students' academic performance.

The results show indirect effects of parental acceptance/rejection, and psychological adjustment in students' academic performance.

Discussion

In this study we carried out analysis on a hypothetical model, based on the relationships between different variables which were included: Academic achievement, parental acceptance/rejection, psychological adjustment Academic self-concept and motivation for learning.

Initial analyzes of the hypothetical model revealed a certain lack of adequacy to the data. This has led to the introduction of some changes in order to make the model acceptable and plausible. Among the changes introduced is the suppression of the relationship between parental acceptance/rejection, and all the other variables than psychological adjustment. Psychological adjustment only revealed an effect on academic self-concept. The relationships with other variables were suppressed. Academic self-concept revealed effects both on the motivation for learning and on the academic achievement of the students. Consequently, it was decided to suppress the remaining relations of academic self-concept with the other variables.

In relation to academic achievement, this variable was only directly affected by academic self-concept.

The results show that parental acceptance/rejection have a direct impact on students' psychological adjustment. These results support the broader postulate of IPARTheory which points to the undeniable influence of parents or primary care providers on the psychological adjustment of children [52, 53, and 54]. In a study carried out with children and adolescents, 26% of the variation found in the psychological adjustment of children and adolescents was explained by parental acceptance / rejection perceptions [27]

The most widely accepted question in the literature on interpersonal acceptance/rejection theory is the undoubted importance of the perception of paternal acceptance/rejection for children's psychological and social development. [53, 54]. The vast majority of studies in the literature often analyze the relationships between parents and children without differentiating the father from the mother. This leads to losses in specific important information, in terms of evaluation and intervention [61].

In a meta-analytic investigation, [28] made the distinction between the contributions of maternal and paternal acceptance/rejection for psychological adjustment. The authors found results pointing to an explanation of paternal acceptance/rejection in the psychological adjustment of 38% and, maternal, of 24%. The parental acceptance/rejection that revealed a greater impact on the psychological adjustment was the maternal one, unlike the results that were obtained by our study. For us, the perception of parental acceptance/rejection that revealed a greater impact on the psychological adjustment was the maternal one (0.35), since the paternal one revealed a value of (0.21).

The various research studies on parental acceptance/rejection emphasize the premise that the father, not just the mother, actively contributes to the psychological adjustment of the children. The data we have analyzed point to the same evidence [52] In spite of this, we found a greater influence from maternal acceptance/rejection in the psychological

adjustment. Similarly, the authors [12] reported that maternal warmth better predicts the emotional adjustment of Chinese children. This factor can be explained on the basis of cultural differences. In fact, most studies conducted on the Interpersonal Theory of Acceptance/Rejection basis are usually conducted in the American continent and in the East, although there is a considerable number of researches conducted in European countries such as Portugal, Spain, the Netherlands, Belgium, Greece, Switzerland, among others. In western cultures, as in the case of Chinese culture, the assumption that mothers play a major role in raising their children does not seem strange. The mother, a reference for caring, support and support, from early on to the survival of the child assumes, in Portuguese culture, tendentially matriarchal, in which responsibilities and parental accompaniment is a fundamental role.

Regarding the psychological adjustment, the results of our study pointed to an effect on students' academic self-concept. Some previous studies have already found results showing the positive relation of psychological and social adjustment with self-concept, namely academic [5].

Several studies indicate that academic self-concept contributes to motivation for learning. Students with a higher academic self-concept will be able, more easily, to set personal goals for their lives, as well as to develop the self-determination necessary to pursue them, always at their own will [7].

Autonomous motivation for learning emerges, in some studies, as a mediating variable in the relationship established between academic self-concept and academic achievement [38] Our data analysis excluded the possibility that learning motivation plays a mediating role in the relationship between academic self-concept and academic performance.

Our results also demonstrate that students with a higher academic self-concept are more inclined to obtain better school grades. In the literature, it can be found that adolescents with a higher academic self-concept tend to obtain higher school grades [2015].

It should be noted that academic achievement is more strongly associated with academic self-concept and its specific dimensions than with more global self-assessments (eg global self-concept or self-esteem). The results elucidate a very high effect of the academic self-concept on the academic achievement. This was, moreover, the effect which proved to be the strongest in the whole analysis. Regarding the direct relationships that were left to fall into the hypothetical model that we have elaborated, because they were found to be non-significant with parental acceptance/rejection perceptions, we refer the academic self-concept, the motivation for learning and the academic achievement. Contrary to what we've found in the literature which referred to the existence of an association between these variables and the perception of parental acceptance/rejection, the model that we verified as adjusted did not reflect this relationship between the variables. The relationship between parental acceptance/rejection and academic self-concept was shown to be mediated by psychological adjustment. It should be noted that academic self-concept, because it is specific to the academic area, is not referring to the global self-concept. We may somehow have found a non-direct relation with the perception of parental acceptance/rejection because of that fact.

Psychological adjustment did not reveal, in our final model, a direct link to students' academic performance. This relationship was mediated by students' academic self-concept. Psychological adjustment didn't demonstrate to have effect on motivation for learning. Contrary to what the literature refers to, in this matter. Authors have shown that people

who have lower levels of psychological well-being put more emphasis on extrinsic aspirations [26]. Often, subjects who revealed higher levels associated with their psychological well-being presented concomitantly higher values for autonomous motivation [8].

Academic self-concept was directly associated with academic performance, in the strongest association of the whole model (0.97). Still, academic self-concept was found to be associated with motivation for learning.

A study by [17], in which three conceptual models were studied to examine the relationship between academic self-concept, autonomous motivation for learning and academic performance, important conclusions were drawn. The results of the analysis provided good support for the hypothetical model, in which autonomous motivation for learning mediates the relationship between academic self-concept and academic performance. In our research, the direct relationship between academic self-concept and motivation for learning was found. However, the motivation for learning was not associated with the academic performance of the students.

The complex statistic that was used for a set of 6 variables, the fact that the model obtained as adjusted is only one among several possible, without it being possible to draw deterministic conclusions, and considering the strongest association from academic self-concept to academic performance may help to explain the lack of a direct relationship between psychological adjustment, motivation for learning, and academic performance. However, there is an indirect relationship between psychological adjustment and academic performance. This association is predicted to be direct in the conceptual outline elaborated by [1] as a suggestion for future research to contribute to the evolution of the state of art. However, the brief suggestive scheme only included the variables parental acceptance/rejection perceptions, psychological adjustment, and academic achievement. When we test other variables such as motivation for learning and academic self-concept, it makes sense to find indirect effects, for instance, instead of direct effects due to a bigger number of variables.

We suggest more investment in the study of the relation between parental acceptance/rejection, psychological adjustment and academic achievement of students. Variables such as academic self-concept and motivation for learning, for example, should be considered in order to make progress in relation to knowledge.

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