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Research article

Education

UNDERSTANDING LOW ACADEMIC ACHIEVEMENT BASED ON PASS AND ERICKSONIAN HUMANISTIC THERAPY

了解基于及格和爱立克森人本主义疗法的低学业成绩

Sílvia Mayoral-Rodrígez [a, b, c], Frederic Pérez-Alvarez [a, c, d, *], Carme Timoneda-Gallart [a, b, c]
[a] Institute of Quality of Life, University of Girona
Plaça de Sant Domènec, 3, 17004 Girona, Catalunya, Spain, dir.irqv@udg.edu
[b] Faculty of Education and Psychology, University of Girona
Plaça de Sant Domènec, 3, 17004 Girona, Catalunya, Spain, fpereza@comg.cat, deg.educacio@udg.edu
[c] Foundation Carme Vidal of NeuroPsychoPedagogy
Francesc Eiximenis, 16, entr. 1a, 17001 Girona, Catalunya, Spain, info@fcarmevidal.com
[d] Emeritus of the Dr. J. Trueta University Hospital of Girona
Avinguda de França, S/N, 17007 Girona, Catalunya, Spain, hospital@htrueta.scs.es

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Abstract

Academic underachievement is a burning problem far from being solved. This study evaluated the efficacy of a humanistic psychotherapy intervention program based on planning, attention, successive and simultaneous (PASS) inductive learning, and indirect metaphorical Ericksonian communication grounded in the neuroscientific knowledge of human behavior. The rational neuroscientific foundations are explained throughout the discussion, highlighting the interaction cognition-emotion. The sample was 600 subjects classified as low achievers, very low achievers, and behavioral-psychosomatic dysfunctional low achievers. The mean age was 13.93 (SD = 1.56; range 12-17), 29.5% women. A normal control group of 172 subjects was selected (mean age, 13.88; SD = 1.75;range 12-17; 49.4% women). ANOVA and stepwise regression analysis were performed. No PASS deficit explains the low achievers. A dysfunctional emotional reason is suggested. A lower simultaneous PASS appears related to very low achievers. A lower planning PASS and the "N" pattern appear related to behavioral-psychosomatic low achievers. The "N" pattern is a suggestive marker of emotional dysfunction. After 6 months of intervention, 55% of very low achievers, 85% of low achievers, and 80% of behavioral-psychosomatic participants did not satisfy the criterion of an underachiever. More studies are required to contribute to the accumulative understanding of scientific phenomena, and so investigate replication.

Keywords: Underachievement, PASS Theory, Inductive Learning, Indirect Metaphorical Communication, Neuroscience

摘要

学业成绩不佳是一个远未解决的紧迫问题。本研究评估了基于计划、注意力、连续和同时归纳学习以及基于人类行为的神经科学知识的间接隐喻埃里克森交流的人文心理治疗干预计划的有效性。在整个讨论中解释了理性的神经科学基础，突出了认知-
情感的相互作用。样本是600名被分类为低成就者、非常低成就者和行为-
心身功能障碍低成就者的受试者。平均年龄为13.93岁（标准差=1.56；范围12-
17），女性占29.5%。选择了172名受试者的正常对照组（平均年龄，13.88岁；标准差=1.75；范围12-
17；49.4%为女性）。进行了方差分析和逐步回归分析。没有计划、注意、连续和同时赤字解释了低成就者。建议有功能失调的情绪原因。较低的同时计划、注意、连续和同时似乎与非常低的成就有关。较低的计划通过和“N”模式似乎与行为心身低成就者有关。“N”型是情绪功能障碍的暗示标志。经过6个月的干预，55%的非常低成就者、85%的低成就者和80%的行为心身参与者不满足成绩不佳者的标准。需要更多的研究来促进对科学现象的累积理解，从而调查复制。

关键词: 成绩不佳，计划理论，注意力，连续和同时，归纳学习，间接隐喻交流，神经科学

I. INTRODUCTION

The extant literature on academic underachievement is difficult to interpret because of the methods used to determine it. The question arises whether underachievement is nature or nurture [1]. Nature versus nurture: Each child inherits a vast amount of genetic information from their parents unshared with other children with underachievement. Their environment and experiences also shape their development [2], [3] as they grow up.

Academic underachievement can result from a specific learning disorder like dysphasia, dyslexia, dyscalculia, or ADHD, but it is possible without it. Behavioral deficits often predict underachievement, but the cause-effect relationship [4] is not clear. Most psychological disorders are also associated with underachievement, but again the cause-effect relationship is yet to be established in each case. According to psychometric tests, low cognitive functioning (intellectual functioning) is also associated with underachievement, but again this may be a cause or, on the contrary, consequence. Academic abilities can be measured using standardized and norm-referenced tests of achievement. This assessment categorizes a part of the spectrum of underachievement, but not its nature and genesis, as we will see later [3].

Thinking can be interpreted in light of the planning, attention, successive and simultaneous (PASS) theory of intelligence [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21] and feeling in light of current knowledge of confidence-unconfidence (security-insecurity) processing [16], [22]. In this regard, it is relevant the interrelation between cognition and feeling, and how cognitive processing is subject to the processing of feeling in certain cases [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32], [33] to the point that verbal self-reporting can be a cognitive bias [34], [35].

In the last years, behavioral neuroscience has grown remarkably [15], [16], [21]. Neurologically speaking, the behavior results from the neurological activity, whether thought, feeling, or action. Achievement involves thought, feeling, and action. It is well established the relevant role of subconscious processing in both cognitive processing (thought) and confidence-unconfidence feeling processing [36], [37], [38], [39], [40], [41], [42], [43], [44], [45], [46].

A substantial component of any behavior is conscious and unconscious decision-making. We claim that decision-making results from what one feels more unconsciously than consciously, but not on a deliberate, rational calculation of consequences when a dysfunctional status is present. We decide and do what we feel. The most strong feeling is self-confidence (security). In this assumption, the rational arguments (verbal self-reporting) to explain behavior and decision-making are a defensive-protective cognitive bias triggered by the fear (unconfidence) processing [34], [35] when this processing takes place. A verbal self-reporting is questionable. Likewise, actions or behaviors that occur in the same context of insecurity are defensive behavioral biases subject to misinterpretations.

With these fundamentals in mind, the ideal diagnostic-therapeutic intervention [47], [48], [49] is to achieve defense and protection behaviors disappear, to make possible non-defensive unbiased decision-making and behavior. That is achieved through verbal and non-verbal communication and actions (experiences) to make the illogical (contradiction, exaggeration, disproportion) of defensive

behaviors, including cognitive bias. It's like an exposure therapy characteristic of anxiety problems but working unconsciously. A communication based on indirect metaphorical hypnotic Ericksonian communication is advisable to manage painless communication [50], [51], [52], [53]. This communication consists of paying full attention (the participant) to what is being said or/and done by the therapists, so the mind does not wander off to other biased thoughts and associated painful or unpleasant feelings. Span attention is limited [15], [16], [22], [51]. This procedure gives priority to inductive learning that has demonstrated not only near transfer but far transfer, in contrast with deductive learning [5], [6], [7], [13]. It involves getting the best self-confidence possible. Greater self-confidence is linked to the best well-being: the less defensive behaviors, the better decision-making.

A. The Importance of Study

Previous studies of this nature lack to date. Concerning the academic contribution, the following points should be highlighted:

. Underachievement can be explained neurologically as behavior and decision-making.

. Both cognitive and emotional processing are responsible for underachievement.

. Poor self-confidence conditions cognitive and emotional processing and underachievement.

. Diagnosis and intervention must take into account these principles.

. PASS inductive learning and indirect metaphorical Ericksonian communication work.

B. Objective and Hypothesis

The overall goal of this study is to test the hypothesis about the effectiveness of the PASS and a humanistic intervention based on both inductive learning and indirect metaphorical Ericksonian communication to diagnose and treat academic underachievement. It would be expected to produce good gains.

II. Methodology

A. Participants

The participants were recruited from among those (urban schools/middle-class) who come to the Foundation Carme Vidal de NeuroPsicoPedagogía due to low academic achievement. Using data from the teacher rating, all of them (n = 600) had low achievement defined as achievement lower than the 25th percentile of the norm group across one academic year. The mean age of the sample was 13.93 (SD = 1.56; range 12-17), 29.5% women. They were separated into three groups. Group 1, very low achievement lower than 10th percentile (n = 204; mean age, 13.59; SD = 1.44; range 12-17; 32.8% women). Group 2, low achievement between 25th and 10th percentile (n = 138; mean age, 14.23; SD = 1.80;range 12-17; 26.8% women). Group 3, low achievement (lower than 25th percentile) with disruptive behavior (externalizing behavior problems) and/or somatic syndrome disorder (n = 258; mean age, 14.3; SD = 1.48;range 12-17; 28.3% women). This group will be designated behavioral-psychosomatic low achievement. The vast majority of disruptive behavior is especially aggression and poor interpersonal relationships with peers and teachers. A control group with achievement higher than the 25th percentile was selected with students from the city's schools (n = 172; mean age, 13.88; SD = 1.75; range 12-17; 49.4% women) that serve a predominantly urban area of a large city. It allows us the comparison of underachiever children to their typically achieving peers.

Trained psychotherapists qualified in educational psychology performed the procedure of recruitment, getting information directly from the school. An unstructured informal and open-ended interview was carried out with participants and parents of cases and controls. So there is a high probability that they will give 100% truthful answers. A pediatric neurologist assessed each case and control by practicing a discerning clinical history and checking registered personal medical history to confirm diagnoses of disruptive behavior and somatic disorders according to DSM-5 and rule out any other comorbidity or condition. In cases and controls, dysphasia, dyslexia, dyscalculia, ADHD, and psychiatric comorbidity were ruled out. As needed, the following studies were performed according to the protocol previously reported [17]: cardiological examination, both auditory and visual event-related potential, thyroid study, sonography, video-EEG, otorhinolaryngology, and ophthalmological exploration. Exclusion criteria were any child psychiatric disorders, comorbidity, previous medication, or other therapy in progress. Samples weren't grouped via sensory deprivation, socioeconomic background, ethnic pattern, or cultural or instructional factors. Informed consent was obtained from parents or guardians of each participant. The study follows the guidelines of the Fundació Carme Vidal human research ethics committee.

B. Instrument: Cognitive Assessment System

(CAS)

This battery assesses PASS processing, namely, planning, attention, successive and simultaneous. Tests of planning are: matching numbers, planned codes, and planned connections. Those of attention are expressive attention, number detection, and receptive attention. Simultaneous tests are nonverbal matrices, verbal-spatial relations, and figure memory. Successive ones are word series, sentence repetition, sentence question (from 8 to 17 years), and successive speech rate (from ages 5 to 7 years). Each of the four PASS scales yields a standard score with a normative mean of 100 and a standard deviation (SD) of 15. For three subtests in each of the four scales, the mean is 10, and the SD is 3. Baseline cognitive scores were compared to 6 and 12 months follow-up scores.

Matching numbers ask for children to devise a strategy to find and underline two numbers that are the same in a row. The numbers increase in length from one digit to seven digits. Planned codes show distinct a set of codes and arrangements of rows and columns. A legend at the top of each page shows how letters correspond to simple codes (e. g. A, B, C, D correspond to OX, XX, OO, XO, respectively). Children must fill in the appropriate codes in empty boxes beneath each letter efficiently (plan). Planned connections require children to efficiently connect numbers in sequence or numbers and letters in alternating orders. Expressive attention demands children to name the color of ink in words blue, yellow, green, and red that are printed according to the Stroop phenomenon. Number detection consists of pages of numbers in different formats. Children are required to find, for instance, numbers 1, 2, and 3 on a page containing many distractors (e. g., the same number printed in different fonts). The child's performance is timed, taking into account accuracy (correct minus false detections). Receptive attention demands the child identify letter pairs that meet specified criteria among many letter pairs that do not. Non-verbal matrices show shapes and geometric designs that are interrelated through spatial or logical organization. Verbal-spatial relations show drawings and a printed question; for instance, which picture shows a circle to the left of a cross under a triangle above a square? ". Figure memory orders the child to identify a geometric design when it is embedded in a complex figure. Word series demands the child to repeat words in the same order as stated by the examiner. Sentence repetition instructs the child to repeat sentences, such as "the blue is yellowing," read aloud by the examiner. Sentence questions (for those aged from 8 to 17 years) use the same previous sentences but differently. Children have to read a sentence and are then asked a question about the sentence. For example, the sentence: "The blue is yellowing". The question: "who is yellowing?" The answer: "the blue". Successive speech rate requires the child to repeat a series of words in a particular linear order [17].

The standard scores of 90 and 80 are used to decide below-average performance to establish cognitive weakness. These scores are based on being below the average (90−99) and low average (80−89) descriptive categories of PASS scores [11]. PASS assessment was performed before and after the intervention.

C. Procedure

All participants except those in the control group participated in one session every week for six months. Data were collected at the baseline and 6-month follow-up post-intervention. Therapists with extensive experience conducted all the sessions and followed the established procedure [14]. On the other hand, children continued their normal school attendance. The therapeutic intervention was based on the PASS inductive learning and humanistic psychotherapy grounded in the neuroscience knowledge of human behavior. Humanistic psychology tries to help people fulfill their potential and maximize their well-being. It stresses the good in human behavior and considers the teacher as a facilitator. It is assumed that emotions and affect fulfill an important role in learning (decision-making), self-knowledge (beliefs), and individual behavior.

So far, neuroscience has shown the cognitive network is subordinated to the emotional self-unconfidence network. The confidence-unconfidence network is crucial. At all times, more unconsciously than consciously, the sensitive brain is processing security/insecurity before (if at all) the cognitive brain recognizes what is going on. The sensitive brain acts first, and then the cognitive brain acts in response. The cognitive brain responds with cognitive bias (verbal self-reporting) to explain and justify the behavior put into action. The effectiveness of the remediation lies in increasing self-confidence — the greater the self-confidence, the better the learning and the behavior. The intervention procedure promotes experiences linked to inductive learning and practicing empathic indirect symbolic communication, in turn, based on Ericksonian communication. Family-related experiences are of primary importance (systemic family therapy). Inductive learning is according

to the planning, attention, simultaneous and successive processing (PASS). These inductions elaborate rules and result in beliefs. Personal beliefs are learned and memorized, but more importantly, they are felt. The objective is to achieve a level of self-confidence from which cognitive bias is minimal.

As previously reported [15], [16], techniques used in this type of communication include metaphors, indirect questions, introductory phrases, hypothetical phrases, melodramatic expression, ambiguous terms, paradox, silence, a saturation of channels of information, false alternative options, confusion, dissociation, prescription of the symptom, and post-trance amnesia. These communicative techniques involve extreme attention focalization (Ericksonian trance state) on the therapist's said and done [51]. Something like full attention in mindfulness. Attention cannot be focused on other thoughts associated with an unpleasant feeling because of the known limited attention span. Meditation is just being relaxed. All this happens unconsciously.

D. Design

A quantitative, associational-correlational, interventional, prospective, longitudinal, controlled, analytical study (before-after) was designed. CAS assessed cognitive performance before-after intervention. The achievement was also assessed before-after intervention. Self-confidence was diagnosed by interpreting masked self-defense behaviors.

E. Statistical analysis

Statistical analysis was performed using the SPSS 22.0 package. We did not find a difference at a statistically significant level between behavioral disorder and psychosomatic disorder children when the behavioral-plus-psychosomatic group was divided into two separate groups; therefore, we do not consider them separately. A single group was formed to rely on a much larger sample size (statistical power). A one-way analysis of variance with post hoc analyses using the Games-Howell post hoc criterion for significance and stepwise regression analysis were performed.

III. Results

A. CAS Cognitive Performance Establishes Differences between Groups

A one-way analysis of variance showed (Table 1) that planning, attention, simultaneous, and successive differ by groups at a statistically significant level ($p < .001$).

Table 1.
Mean differences of cognitive PASS processes by groups

	Df	Sum Sq	Mean Sq	F value	P
Planning	3	64855	21618	206	<.001
Simultaneous	3	96529	32176	275	<.001
Attention	3	59131	19710	138	<.001
Successive	3	55300	18433	152	<.001

Post hoc analyses (Table 2) using the Games-Howell post hoc criterion for significance indicated that planning, attention, successive and simultaneous differed at a statistical high ($p < .001$) significant level between all possible pair wise comparisons among the groups except that simultaneous differed between control and behavioral-psychosomatic groups at a lower ($p = .047$) significant level.

Table 2.
Mean differences between groups (Games-Howell)

PASS Processes		Groups	Means Dif.	Std. Error	*P*
Planning	Control	Very Low Achievement	15.57	1.09	< .001
		Low Achievement	3.14	1.02	.011
		Behavioral/Psychosom.	22.17	0.95	< .001
	Very Low Achievement	Control	-15.57	1.09	< .001
		Low Achievement	-12,43	1.11	< .001
		Behavioral/Psychos.	6.60	1.05	< .001
	Low Achievement	Control	-3.14	1.02	.011
		Very Low Achievement	12.43	1.11	< .001
		Behavioral/Psychosom.	19.02	0.98	< .001
	Behavioral Psychosomatic	Control	-22.17	0.95	< .001
		Very Low Achievement	-6.60	1.05	< .001
		Low Achievement	-19.02	0,98	< .001
Simultaneous	Control	Very Low Achievement	14.33	1.07	< .001
		Low Achievement	-19.64	1.11	< .001
		Behavioral/Psychosom.	-2.54	0.98	.047

	Very Low Achievement	Control	-14.33	1.07	1.21	< .001
		Low Achievement	-33.97	1.09		< .001
		Behavioral/Psychos.	-16.87			< .001
	Low Achievement	Control	19.64 33.97	1.11	1.21	< .001
		Very Low Achievement	17.10	1.13		< .001
		Behavioral/Psychosom.				< .001
	Behavioral Psychosomatic	Control	2.54 16.87	0.98	1.09	.047 < .001
		Very Low Achievement	-17.10	1.13		< .001
		Low Achievement				
Attention	Control	Very Low Achievement	Low Achievement 14.87	1.19	1.13	< .001
		Behavioral/Psychosom.	-.42	1.08		.987 < .001
			19.27			
	Very Low Achievement	Control	-14.87	1.19	1.36	< .001
		Low Achievement	-15.30	1.19		< .001
		Behavioral/Psychosom.	4.40			< .001
	Low Achievement	Control	0.42	1.28	1.36	.987 < .001
		Very Low Achievement	15.30	1.27		< .001
		Behavioral/Psychosom.	19.69			
	Behavioral Psychosomatic	Control	-19.27	1.08	1.19	< .001
		Very Low Achievement	-4.40	1.27		< .001
		Low Achievement	-19.69			< .001
Successive	Control	Very Low Achievement	Low Achievement 18.87	1.02	0,95	< .001
		Behavioral/Psychosom.	-2.21	1.03		.092 < .001
			13.00			
	Very Low Achievement	Control	-18.87	1.02	1.08	< .001
		Low Achievement	-21.09	1.15		< .001
		Behavioral/Psychosom.	-5.87			< .001
	Low Achievement	Control	2.21	0,95		.092 < .001
		Very Low Achievement	21.09	1,08		< .001
		Behavioral/Psychosom.	15.22	1,09		
	Behavioral Psychosomatic	Control	-13.00	1.03	1.15	< .001
		Very Low Achievement	5.87	1.09		< .001
		Low Achievement	-15.22			< .001

A good simultaneous is linked to better academic performance. Also, attention and success did not differ statistically between the control group and low achievement. Therefore, low achievers and control groups are similar in two processes and different in two processes. That is, the low achievers appear to be the least dysfunctional. Very low achievers and behavioral-psychosomatic low achievers and control groups are different in the four processes, which means greater involvement. We found a main effect of planning ($\eta 2 = .447$), attention ($\eta 2 = .350$), simultaneous ($\eta 2 = .518$), and successive ($\eta 2 = .373$).

As can be seen in Table 3, a first approach to the cognitive diagnosis based on the result in the CAS tells us that the lower PASS scores are typical of the very low achievement group. However, it should be noted that planning and attention score somewhat less in the behavioral-psychosomatic group. This group meets the low average score (80-89) in all PASS processes [11]. It means greater involvement in very low achievers and behavioral-psychosomatic low achievers and less involvement in low achievers.

Table 3.
Means and standard deviations for each group

	Planning		**Simultaneous**		**Attention**		**Successive**	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Control N=172	99.71	9.15	100.33	9.15	102.72	10.1	97.19	8.13
Very Low Achievement N= 204	84.14	11.9	86.00	11.83	87.85	11.96	78.32	11.49
Low Achievement N= 138	96.57	8.67	119.96	10.34	103.14	11.95	99.41	8.41
Behavioral/Psychosomatic Disorder N= 258	78.56	11.37	109.89	10.78	81.09	9.85	90.41	8.47

B. Cognition-Emotion Interrelation and Predictive Value

A stepwise regression analysis was performed (Table 4) to predict each group based on planning, attention, simultaneous, and successive.

Table 4.
Hierarchical regression analyses for each group (*p < .05; **p < .01; ***p < .001)

		Very Low Achievement		Low Achievement				Behavioral/Psychosomatic Disorder	
Step		**β**	**ΔR^2**	**β**	**ΔR^2**	**Step**		**β**	**ΔR^2**
1.	Simultaneous	-0.573***	0,329***	0.565***	0.319***	1.	Planning	-0.522***	0.273***
2.	Successive	-0.193***	0,028***	0.127***	0.012***	2.	N Profile	0.397***	0.149***
3.	N profile	-0.210***	0,034***			3.	Simultaneous	0.225***	0.024***
4.	Planning	0.130**	0,009**			4.	Attention	-0.194***	0.014***
5.	Sex	0.062*	0,004*			5.	Successive	-0.115***	0.009***

The results of the test indicated that simultaneous (p < .001), successive (p < .001), "N" profile (p < .001), and planning (p = .01) in this order were significant predictor of very low achievement with R2 (percentage of total variance/effect size) of 0.32 versus very low values of 0.02, 0.03, and 0.00, respectively for the other predictors. Simultaneous, successive, and the "N" pattern are negatively related. Simultaneous appears as the main predictor. The less simultaneous pattern is, the more very low achievers with R2 of 0.32 are shown versus 0.02, 0.03, and 0.00 of the rest of the predictors. At the same time, simultaneous (p < .001) and successive (p < .001) in this order were significant predictors of low achievement with respective R2 of 0.31 and 0.01. That is, the more simultaneous, the more low achievers with R2 of 0.31. The R2 of successive is only 0.01. On the other hand, planning, "N" profile, simultaneous, attention, and successive in this order were significant predictors of behavioral-psychosomatic low achievers with R2 of 0.27, 0.14, 0.02, 0.01, 0.00, respectively. The less planning, the more behavioral-psychosomatic low achievers with R2 of 0.27; the more "N" profile, the more behavioral-psychosomatic low achievers with R2 of 0.14. The rest of the predictors scored an R2 of 0.02, 0.01, and 0.00. Additionally, there was a significant negative correlation between planning and the "N", $r(N = 258) = -.68$, $p = .001$, $r2 = .40$. That is, the more "N", the less planning.

As can be seen, by the frequencies tabulated in Table 5, the "N" pattern was observed in low achievement and behavioral-psychosomatic disorder groups.

Table 5.
"N" profile for each group

	"N" Profile						
	No		**Yes**		**X^2**	**P**	**p**
	n	**%**	**n**	**%**			
Control N = 172	172	100%	0	0%			
Very Low Achievement N = 204	204	100%	0	0%			
Low Achievement N = 138	70	50.70%	68	49.30%	4.26	.039	
Behavioral/Psychosomatic Disorder N = 258	103	39.90%	155	60.10%			

The percentage of "N" pattern differed between these two groups at statistically significant level (X2(1,N = 396) = 4.26, p = .034). The “N” pattern was more frequent in the behavioral-psychosomatic disorder (Figure 1).

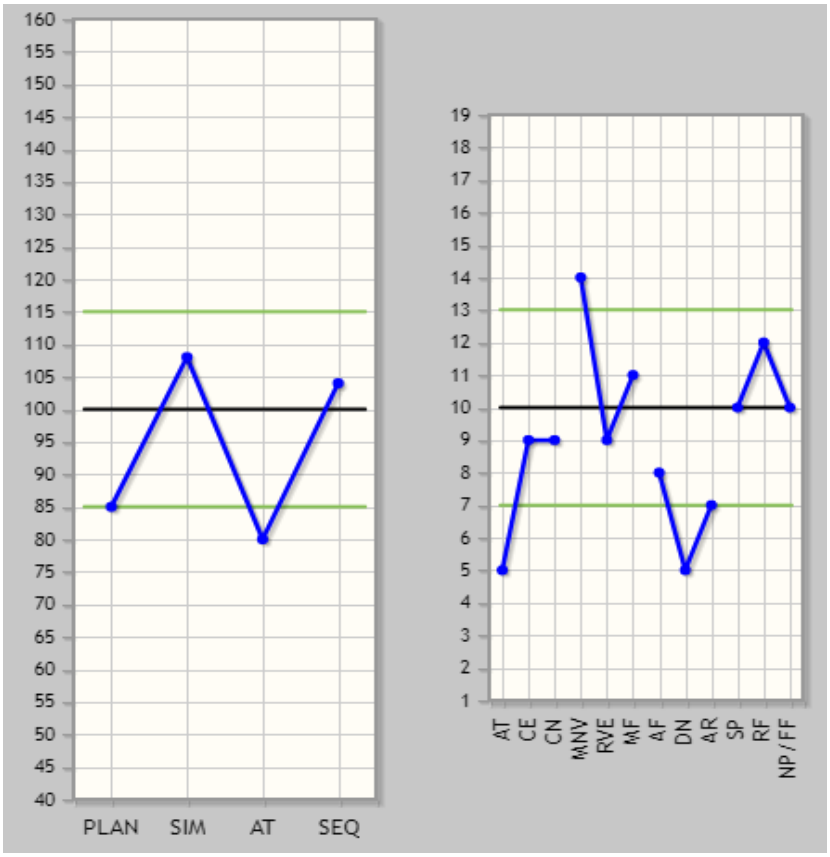

Figure 1. The “N” Pattern as a Marker of Emotional Dysfunction. The "N" PASS pattern on the left and the right a difference larger than one standard deviation between the sub-tests assessing the same process (i.e., planning, attention, simultaneous, or successive), what is always associated. PLAN is planning, SIM is simultaneous, AT is attention, and SEQ is successive. On the right, the sub-tests for each test

After intervention (Table 6), low achievers and behavioral psychosomatic low achievers improved planning and attention scores at a statistically significant level compared with planning and attention scores at baseline.

Table 6.
Comparison of planning and attention processes before and after remediation.

	Very Low Achievement N = 204				**Low Achievement N = 138**					**Behavioral/Psychosomatic Disorder N = 258**				
Processing	**Mean**	**SD**	***t****	***p***	**Mean**	**SD**	***t****	***p***	**Cohen's *d*****	**Mean**	**SD**	***t****	***p***	**Cohen's *d*****
Planning before remediation	84.14	11.90			96.57	8.66				78.56	11.37			
Planning after remediation	84.38	11.72	-1.30	NS	96.88	8.84	-2.367	.019	0.20	81.21	10.19	- 8.38	<.001	0.26
Attention before remediation	87.85	12.96			103.14	11.94				83.45	12.23			
Attention after remediation	87.90	13.04	-1.07	NS	103.23	11.96	-2.083	.039	0.17	83.87	11.92	- 3.373	.001	0.21

*Paired-Samples T Test;
**Cohen's effect size: trivial (< 0 .1), small (0.1– 0.3), moderate (0.3– 0.5), large difference effect (> 0.5)

Low achievers improved less and less significantly in both planning (p = .019, *Cohen's d* = 0.20) and attention (p = .039, *Cohen's d* = 0.17) versus behavioral-psychosomatic low achievers with better improvement in both planning (p < .001, *Cohen's d* = 0.26) and attention (p = .001, *Cohen's d* = 0.21). Furthermore, the frequency of the "N" pattern dropped noticeably in low achievers and behavioral-psychosomatic low achievers. It was found (McNemar test) that the proportion of low achievers with the "N" pattern decreased from 49.30 % in the measurement before to 42 % after the intervention (p = .002). In turn, the proportion of behavioral-psychosomatic low achievers with the "N" pattern decreased from 60.10 % in the measurement before to 50 % after the intervention (p <.001). Complementary to the

above, a high proportion of subjects with undone "N" patterns did reduce the length of the first and third tranches of the "N" (Fig. 1) corresponding to planning and attention, which can be interpreted as the presence of a certain effect on them. Later we will interpret this in the discussion. According to academic authorities, intervention effectiveness was assessed by the annual achievement gains in terms of performance above the 25th percentile at the end of the following academic year. More specifically, 55% of very low achievers, 75% of low achievers, and 80% of behavioral-psychosomatic participants satisfied this criterion.

IV. Discussion

To begin with, the CAS was used to assess a sample defined by academic underachievement without specific learning disabilities. As expected, planning and attention significantly improved where the "N" pattern was present, that is, low achievers and behavioral-psychosomatic low achievers (Table 5 and 6). Consistent with this, the frequency of the "N" pattern dropped significantly in these two groups (Table 7). These results support the conclusion that the effect of the intervention lies largely in the emotional impact that we defend as inherent to the intervention procedure. We will return to this later. Second, as would be expected, low achievers are closer to normal than very low and behavioral-psychosomatic low achievers, which are disparate for the worse (Table 1, 2, and 3). A poorer simultaneous appears as a predictor of very low achievers. An excellent simultaneous but not planning, attention, and successive are clearly described in gifted children, which allows us to infer a greater effect of simultaneous on academic performance [20]. Also, poorer planning and the "N" pattern appear as a predictor of behavioral-psychosomatic low achievers (Table 4). Third, the "N" pattern appears in low (but not very low achievers) and behavioral-psychosomatic low achievers, but much more often (p = .039) in the behavioral-psychosomatic group (Table 5), where we claim the emotional factor is much more relevant. The presence of the "N" pattern in the low achievers could explain the positive relationship between simultaneous-low achievers in the regression analysis. However, the "N" pattern does not appear as a predictor. Fourth, a humanistic intervention procedure based on inductive learning and indirect metaphorical communication like Ericksonian hypnosis was used, showing success figures worth bearing in mind. Throughout the discussion, we will expose the foundations of this mental technique.

To date, sufficient evidence has been accumulated of the usefulness of CAS to assess intellectual performance [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20]. Two points must be highlighted. One: the result in the score is a current profile, but not necessarily the possible potential profile after intervention (dynamic concept of intelligence). That is, the score can be lessened with successful intervention. The other: inductive learning is better than deductive learning when the remediation takes place, as demonstrated by the PASS. The emphasis is on the child's solution to the task, not on the instructed verbal procedure, avoiding direct skills teaching. This experience of self-determination provides growth of the self-concept and self-confidence.

We can deduce that the low achievers show, as expected, the least dysfunction. Only low achievers but not the other groups show no difference with the control group in two processes (ANOVA). The main predictor (Table 4) is simultaneous but positively related. Low achievers show better scores simultaneous than the control group (Table 3). Remember that simultaneous can compensate for other deficiencies if enough planning is present [20]. Low achievers show average or near average scores in planning, attention, simultaneous and successive (Table 3). According to this, the reason for low achievement is unintellectual in terms of PASS assessment. The fact that the "N" pattern is present in this group allows us to postulate that it has to do with low achievement, although it does not appear as a predictor. Instead, the very low achievers are mainly associated with poorer simultaneous (Table 4), which means they are associated with current intellectual dysfunction in PASS terms. The emotional engagement [54] in this group is unrevealed in the "N" pattern. In other words, the cognitive component, regardless of the emotional, seems to explain the result mostly.

On the other hand, the behavioral-psychosomatic low achievers are typically associated with poorer planning and the "N" pattern (Fig. 1). Years ago, we described the "N" pattern as a marker indicator of emotional blockage based on having checked that said pattern disappeared with only emotional intervention [15], [16], [20], [21]. Particularly, planning improves overcoming the simultaneous score and undoing the "N" pattern. Planning with selective attention is part of the executive function is the PASS processing is most

influenced by the emotional state [20]. Considering all three groups, this one shows the lowest planning by far (Table 3). Planning is the most sensitive processing to change due to emotion, both positively and negatively. According to our extensive experience, low planning will only be diagnosed as primarily cognitive and not secondarily cognitive because of emotional blockage if it does not respond to the intervention with a significant increase in score. From our results (Tables 6 and McNemar), the behavioral-psychosomatic low achievers satisfied this criterion.

A point to be discussed is the rationale of humanistic intervention carried out. The most determining factor of behavior is the process of feeling security-insecurity (confidence-unconfidence) for survival reasons. We first clarify the term emotion from now on. Therefore, we identify self-confidence with sensitivity; the less self-confidence, the more hypersensitivity to react. In turn, the more hypersensitivity, the less rationality. In this way, self-confidence conditions behavior in terms of thoughts, sensations, and actions [55], [56]. It is well accepted that emotions interfere with central cognitive tasks. As the amygdala-hippocampus interrelationship shows, we memorize what we have lived as ideas and associated feelings throughout our lives [47]. The sum of experiences of security plus those of insecurity determines the state of self-confidence. Positive and negative emotions are not independent of each other at any given point in time, which means that these emotions tend to suppress each other. This processing works such that a classical conditioning phenomenon is constantly occurring. For instance, you can memorize fear associated with one experience with color, sound, smell, shape, touch, and so on. Later on, the same smell as part of a different neutral experience will process the same feeling without reason for it. Therefore, the feeling is highly prioritized for safety and survival reasons and explains intuitive and sometimes unjustified visceral responses. When insecurity overcomes security, then counterproductive defensive and protective behaviors are put into action, expressing themselves in the form of thought, feeling, or action. Underachievement and behavioral disorder, and psychosomatic dysfunction can be considered possible defensive-protective behaviors. It should be noted that all of this occurs more unconsciously than consciously.

In support of our argument, much recent neuroscience has found that human rationality is weaker than is commonly presumed, and the emotions make it possible to make decisions [22], [23], [24], [25], [26], [27], [28], [30], [31]. Even preverbal infants express what appears to be nascent moral evaluations [57], and morality is linked to feeling. Particularly, the LeDoux studies [32], [33] on fear processing demonstrated that the amygdala unconsciously responds (thought, feeling, action) to danger before the cortex (thinking brain) has information about what's going on. More relevant, when the cortex subsequently has information not mediated by the amygdala, it does not change its electrophysiological response, consistent with the cortex elaborating thoughts that justify the response to danger (defensive-protective cognitive bias). The intrusive thoughts (linked to distress and anxiety) are evidence of how the mind can make thoughts show up in consciousness without conscious intention or control. Likewise, when the human mind gets scared, such as during a panic attack, its job is to develop all kinds of reasons (cognitive bias) why the panic attack is happening and what to do about it. Humans reason rather poorly, as reported by Mercier and Sperber [34], [35], irrational conscious biases in decision-making being common. For instance, the verbally reported strategy to perform a task may not be the one the child used, according to the child's observable eye movements (body language) [7]. Or paradoxically, a self-verbal asserting of self-confidence can be the opposite. A neuroimaging study [41] concluded that the brain might cheat when learning or behaving, building memorized answers to respond to similar questions. For all of the reasons highlighted in this section, verbal self-reporting is questionable to diagnose and intervene.

Neuroscience is providing new data relevant to the unconscious mind [36], [37], [38], [39], [40], [58], [59], [60] and its role for cognitive and emotional diagnosis and treatment. For instance, people can recognize an image they have seen before even when unaware of having seen it [61]. In about 40 ms, we can form an opinion of a stranger. It is enough time to observe what the subject's face and body language is doing. The brain-mind can interpret it unconsciously if its facial features and body language inspire confidence or danger [46]. Also, neuroscience on anticipatory unconscious processing [43], [44], [45], [62], [63] has found neural activity corresponding to the upcoming choice. As Soon et al. reported [64], [65] a decision can be encoded in the brain activity of the prefrontal and parietal cortex up to 10 s before it enters awareness.

Many body expressions are informative [16]. For instance, eyes up and to the left or the right show simultaneous processing, eyes level and the left or the right show subsequent processing; eyes down and to the left or the right show body sensations, shoulders relaxed and drooped and breathing deeply in the abdominal area depicts tranquility and relaxation. For instance, a wrinkled forehead, contracted jaw, or shoulders were thrown back, shallow breathing in the chest or a fixed grin showed tension and concentration. Likewise, rigid body, unusual posture, rocking back and forth or side to side, leaning to one side, head turns, facial expression (mouth and eyebrows), startled look, a big grin on the face, eye contact, yawning, specific hand movements, particular words or phrases, voice quality and pitch, volume, tone, inflection, speed, tempo (rhythmic, choppy), and so on.

The Ericksonian indirect metaphorical communication [51] is a neurologically proven procedure [50], [52]. The metaphor conveys an idea - thought (message) subject to inductive learning, but more importantly, produces an analgesic-reassuring effect [15], [16], [21]. Distraction, linked to focused attention, limits cognitive and associated feeling processing beyond metaphor processing. That is, extremely focused attention on the metaphor (Ericksonian hypnosis effect) restricts other cognitive processing (thoughts) and the associated memorized painful feeling (discomfort). It is something like the mindfulness-based 5-4-3-2-1 technique: you note and pay attention to five things you can see, four things you can feel, three things you can hear, two things you can smell, and one thing you can taste. The effect of distraction on pain relief has been widely published [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76]. The distraction demands a high degree of attention. It means an analgesic effect, which is the key to avoid resistance and create empathic communication.

The metaphor is based on tangible concrete rather than abstract knowledge, making the message-communication more easily processed and transferred. This pleasant communication allows us to unmask defensive behaviors and gain self-confidence (emotional effect). Analgesia with increased activity in several reward-processing regions has been demonstrated in pain situations while experiencing pleasure. Pleasure and pain correlate negatively [77]. We postulate this procedure promotes extinction learning, which is possible according to a recent contribution from neuroscience [78], [79], [80] by doing something like cold exposure therapy. But even more, the procedure acts as an active avoidance, as has been reported. Active avoidance has been shown to reduce conditioned responding during novel threat conditioning by promoting experiences of active control over the threat [81]. The procedure we describe is mindfulness-like plus interoceptive exposure therapy, that is, full attention associated with controlled, gentle exposure to bodily sensations (feeling).

The chief limitation of this report is the lack of similar studies with which to compare. More studies are needed to contribute to the accumulative understanding of scientific phenomena, and so investigate replication. Another limitation concerns how long the successful effect is in producing desired and lasting change. It arises from the inability to obtain sufficient appropriate evidence about this aspect. Our study proved successful throughout the following academic year but not subsequently in the absence of continued therapy. We hope our ideas might manage, even if, to influence future scholars of the mind. More data are needed to adequately address this important issue to come to additional logical conclusions and give conclusive and satisfactory answers to this research.

Underachievement is the consequence of cognitive performance, and frequently this performance is subject to the emotional state, particularly self-confidence. The diagnosis of low self-confidence is crucial. The diagnosis based on verbal self-reporting or direct interpretation of behaviors without interpreting masked self-defense behaviors is subject to error. Self-confidence can be improved by an intervention procedure based on inductive learning and Ericksonian indirect metaphorical communication. Neuroscientific arguments support these claims. As the PASS theory says, intelligence is dynamic and non-static and capable of improvement.

V. Conclusions

1. Our report is part of the studies that used the PASS, in this case, to define the underachievement.
2. No PASS deficit appears justifying the low achievers, and it is suggested that the emotional blockage could have to do with it or another unknown reason.
3. A lower simultaneous PASS appears related to very low achievers. That is, a PASS cognitive reason seems to explain this group.
4. A lower planning PASS and more frequently "N" pattern, planning more than "N"

pattern, appear associated with low achievers with the behavioral-psychosomatic disorder. Although it could be argued that planning primarily produces the effect, we deduce that the cognitive planning defect is mostly secondary to emotional dysfunction as indicated by the presence of the "N" pattern and the response of both planning and "N" pattern to intervention.

5. Finally, our study supports that the procedure of intervention applied gives successful results worth taking into account. Responsiveness to intervention is worth considering as the change in behavior or performance as a function of intervention. Additionally, consistent arguments based preferably on neuroscience are invoked to explain the effect of the method. The key idea is that decision-making is more emotional than rational when there is emotional dysfunction, questioning how much control and willpower we have over our emotions and self-confidence. The following result is self-reflection will only be useful for self-knowledge if it is not a cognitive bias.

In the light of the results of this study, the proposed research could be presented as follows:

1. Underachievement can be defined as the academic result according to the academic authorities. That implies a poorer performance in terms of results regardless of other considerations, such as a poorer performance than predicted from intelligence tests.

2. A neuro-cognitive battery such as the Cognitive Assessment System (CAS) makes it possible to assess cognitive functioning in terms of brain processing of information.

3. Emotional involvement in cognitive function and behavioral dysfunction can be diagnosed by interpreting defensive and protective behaviors.

4. An intervention procedure based on reducing or eliminating defense behaviors impacts cognitive performance and academic achievement.

5. More studies based on these principles are required to understand this scientific phenomenon and thus investigate replication.

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