Applied Psychology Research 2023; 2(1): 551.
Original Research Article

Exploring the efficacy of neuro-linguistic programming in alleviating school challenges among primary schoolchildren in Lebanon

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ARTICLE INFO

Received: 5 September 2023
Accepted: 11 October 2023
Available online: 18 October 2023

doi: 10.59400/apr.v2i1.551

ABSTRACT: This four-month study investigated the impact of neuro-linguistic programming (NLP) sessions on the strengths and difficulties of 128 elementary school students from a private school in Lebanon. Paired T-test and Pearson correlation analyses examined changes in behavior and academic performance pre- and post-NLP intervention. The findings revealed a significant reduction in headaches, stomachaches, and overall negative emotions such as unhappiness, depression, or tearfulness after NLP sessions. Although the case group had a higher proportion of females, no notable gender-based differences were observed. Positive correlations were identified between student age and emotional and conduct scores. While there was a decrease in reported fights and bullying post-intervention, it did not reach statistical significance. The study advocates for integrating NLP into traditional medical treatment programs, emphasizing its potential as a non-medical intervention, especially in integrated pain management strategies. The research underscores NLP's role in addressing emotional and behavioral challenges among students.

KEYWORDS: neuro-linguistic programming; intervention; schoolchildren; Lebanon; academic performance; parents

1. Introduction

Neuro-linguistic programming (NLP), developed in the 1970s by Bandler, a mathematician and data researcher, and Grinder[1], a language expert, has gained widespread recognition for its role in communication and personal development and as a recognized form of psychotherapy[2]. Moreover, it finds informal but extensive educational use[3]. NLP operates as a set of techniques rather than a theoretical framework. Its primary aim is to address learners' challenges, including fear, habit disorders, learning difficulties, anxiety, sadness, and depression[4,5]. This technique is designed to help individuals overcome their limitations by identifying and modifying restrictive behavior, ultimately enabling them to achieve their learning goals. This approach provides a more pragmatic and optimistic perspective on cognitive processes, enhancing an individual's effectiveness as a learner, regardless of age[6]. Consequently, NLP techniques can offer effective strategies for developing cognitive skills in students[7]. Despite an emerging and sometimes controversial approach to communication and personal development, NLP has become increasingly prevalent in education and teaching[8].

NLP is recognized as an assistive technology that can help educators and learners cultivate skills, including critical thinking, academic success, emotional intelligence, self-confidence, and empathy[9,10]. These abilities can significantly impact the learning process since increased self-esteem and confidence can foster a positive learning environment[11]. When employed in educational settings, NLP empowers teachers to gain a deeper insight into how students learn by understanding the cognitive process as they absorb knowledge. Furthermore, it embraces diverse learning approaches and acknowledges each student's individuality, recognizing that each possesses a distinctive learning style[12]. Pedagogical content based on NLP techniques can equip teachers with tools for effective learning experiences within a classroom. Recent developments in NLP have underscored its importance, with a growing interest in applying its techniques in teaching[8,13]. Nonetheless, a significant challenge associated with NLP methods is the identification of suitable approaches. While NLP plays a crucial role in language acquisition and facilitates learning, further research is needed to explore the factors contributing to educational success[14]. NLP can aid learners in programming their minds and enhancing their communication. It also supports students in achieving better writing skills and overall academic performance[8,14]. NLP has been shown to positively impact the academic achievement, emotional intelligence, and critical thinking of language learners[11]. In Lebanon, children's right to education has been compromised due to the weaknesses of the state and ongoing political instability, which provide limited protection for those at higher risk[15,16]. Inadaptation to online education combined with the economic crisis has led to school dropouts or transitions from private to public institutions[17]. Addressing this issue requires implementing an effective, low-cost approach like NLP to enhance schoolchildren's learning skills and capabilities. Therefore, the main objective of this study is to investigate the impact of NLP on primary schoolchildren in improving school difficulties and challenges following the crises in Lebanon.

2. Methods

2.1. Study design

A cohort (before and after intervention) study was conducted between April and July 2023, spanning four months. It involved using a questionnaire to gather data and assess the evolution of the strengths and difficulties experienced by elementary school students following NLP sessions to enhance their academic achievement. The public can access the study's detailed protocol through the clinicaltrials.gov registry using the identifier NCT05870085.

2.2. Study population

The study included students from a private school in Lebanon, specifically in Beirut. Data collection was accomplished through in-person visits to the school. Inclusion in the study was determined by predefined criteria, which encompassed age (ranging from 5 to 11 years) and grade levels (from 1 to 5). Importantly, the selection criteria did not consider sex, nationality, or ethnicity. The necessary sample size was determined using the G*Power software to examine the mean difference between two related means (matched pairs). The calculation was made a priori, specifying a 95% confidence interval and 80% statistical power, which indicated that 128 participants were needed to detect a minimum effect size of 25%.

2.3. Description of the NLP intervention

NLP encourages sensitivity to individual differences and cultural diversity. In Lebanon, where cultural, religious, and socio-economic diversity is prevalent, incorporating NLP principles can help educators create inclusive learning environments that respect and celebrate the unique backgrounds and

perspectives of all students. Therefore, procedures were established for teachers and students. Teachers underwent a comprehensive training program consisting of 4 sessions to equip them with the skills to effectively use communication and NLP techniques to influence schoolchildren's behavior and academic performance. All students were tested before and after the session to gauge the impact of NLP on education. The NLP-based workshop served as the platform for delivering the intervention. These sessions include "NLP and their impact on the teaching-learning environment", "possible techniques to be used", and "applications of techniques", then followed by "practical activities with children." During these sessions, the practitioner aimed to teach students to adopt different perspectives when observing their thoughts or encountering challenging situations during competition. They were taught to consider the different interpretations they experienced during challenging events. Participants were trained on methods by which they could observe and relate the thoughts from different observer positions, which are "I", "You", and "Others", knowing that it was an imagery process of the event. For example, for the "anchoring" technique, teachers aimed to guide the schoolchildren to remove the dysfunctional thoughts that occurred before and during training. During this phase, participants were guided to recall memories of their optimal performances and to intensify positively related emotions, such as confidence and commitment. Consequently, participants were taught to reject detrimental thoughts and emotional content that hindered their progress.

2.4. Study tool and data collection

Before the session, the student's parents or legal guardians fill out the printed survey used for the data collection. The same survey was also sent to parents two months after the intervention. It was developed after a literature review taking into consideration expert opinions. The questionnaire considered questions related to the general characteristics of the participants, such as the age of the parent completing the survey and his/her relation to the student (mother or father), their current marital status (married or divorced/widowed), their highest level of education (elementary school or less, high school and university or more), their perceived economic situation (less than average, and average or more), working status, smoking status, and the total number of children. Other information, such as the age, sex, and school grade of the student, was retrieved from the school database. The second part included the strengths and difficulties questionnaire. This tool was previously used and validated in epidemiological studies among schoolchildren. It comprised four groups, each with five statements. These statements gathered data on their children's emotional symptoms, conduct problems, hyperactivity, peer problems, and children's prosocial behavior. The survey was translated into Arabic for ease of use by schoolchildren's parents. To reduce recall bias, it was provided by the school directly to students, and then parents were invited to fill it out at their time and place preferences. The school sent many reminders to parents to ensure a higher participation rate.

2.5. Ethical consideration

The institutional review board of the Faculty of Pharmacy of the Lebanese University (reference 3/23/D) reviewed and approved the study protocol, survey, and consent form. These documents were included in the survey packet distributed to parents, featuring the study's objectives and a consent form bearing the legal guardian's signature prominently on the first page. Parents were explicitly informed that their participation was voluntary and they could withdraw it at any time, with only their submitted responses being retained. Confidentiality was rigorously maintained, as no personal identifications were collected, and the surveys were labeled and coded by the school direction. An independent researcher

handled the data entry and analysis to mitigate interviewer bias. Parents were not offered any financial incentives, and the findings were exclusively used for research.

2.6. Statistical analysis

Statistical analysis was conducted using Version 29 of the Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois). Categorical variables were presented in terms of frequencies and percentages. The mean and standard deviation were employed to describe the age of the students and the parents who participated in the survey and the scores for each difficulty group. The assessment of clinical risk, based on the methodology developed by Goodman and Goodman in 2009, was carried out[18]. The paired sample *T*-test was used to examine changes in certain features before and after the implementation of a natural language processing (NLP) intervention. A Pearson correlation analysis was conducted to explore relationships between various quantitative variables and the primary outcome of interest: the total score per group. Variables with *p*-values less than 0.05 were considered statistically significant.

3. Results

3.1. Comparison of the general characteristics of schoolchildren before and after the NLP intervention

Table 1 displays the differences in the general characteristics of schoolchildren before (controls) and after (cases) the NLP intervention. Cases comprised more females (62.0%) than controls (55.8%), with no statistically significant differences ($p = 0.311$). A similar distribution between grades was noted. After the intervention, both the ages of students (8.8 ± 1.6; $p = 0.403$) and parents (40.1 ± 7.5; $p = 0.672$) were slightly higher than before, with no level of significance ($p > 0.05$). The participation rate of parents was comparable among cases (18% fathers and 82% mothers) and controls (17.4% fathers and 82.6% mothers) ($p = 0.895$). Higher percentages of divorced or separated parents were noted post-intervention (13.3%), with no significant differences ($p = 0.435$). Regarding their perceived economic status, 27% of the cases considered themselves less than average, moderately higher than the control group (23.5%; 0.542). The working status was almost equally described in cases and controls, with most of them having one parent working (60.4% and 61.2%, respectively; $p = 0.980$).

Table 1. Comparison of the general characteristics of schoolchildren before and after the NLP intervention.

		Pre-intervention (*N* = 130)	**Post-intervention (*N* = 130)**	
		Frequency (%)	**Frequency (%)**	***p*-value**
Age of student	Mean ± SD	8.6 ± 1.5	8.8 ± 1.6	0.403
Sex	Male	57 (44.2%)	49 (38.0%)	0.311
	Female	72 (55.8%)	80 (62.0%)	
Grade	Grade 1	28 (21.5%)	28(21.5%)	1.0
	Grade 2	19 (14.6%)	19 (14.6%)	
	Grade 3	28 (21.5%)	28(21.5%)	
	Grade 4 Grade 5	29 (22.3%) 26 (20.0%)	29 (22.3%) 26 (20.0%)	
Age of parents	Mean ± SD	39.7 ± 6.2	40.1 ± 7.5	0.672
Relationship with the student	Mother	100 (82.6%)	91 (82.0%)	0.895
	Father	21 (17.4%)	20 (18.0%)	

Table 1. (*Continued*).

		Pre-intervention (*N* = 130)	**Post-intervention (*N* = 130)**	
		Frequency (%)	**Frequency (%)**	***p*-value**
Marital status	Married	108 (90.0%)	98 (86.7%)	0.435
	Divorced or widowed	12 (10.0%)	15 (13.3%)	
Highest level of education	Elementary school/less	16 (13.3%)	12 (10.9%)	0.847
	High school	50 (41.7%)	48 (43.6%)	
	University or more	54 (45.0%)	50 (45.5%)	
Perceived economic situation	Less than average	28 (23.5%)	30 (27.0%)	0.542
	Average or more	91 (76.5%)	81 (73.0%)	
Working status	Both parents work	38 (31.4%)	35 (31.5%)	0.980
	One parent works	74 (61.2%)	67 (60.4%)	
	Both parents don't work	9 (7.4%)	9 (8.1%)	
Total number of children	One	16 (13.2%)	14 (12.7%)	0.971
	Two	56 (46.3%)	48 (43.6%)	
	Three	38 (31.4%)	37 (33.6%)	
	4 or more	11 (9.1%)	11 (10.0%)	

Results are presented through Frequency (Percentages), and ages are presented in Means ± standard deviations. *P*-values < 0.005 indicate statistically significant differences.

3.2. Impact of the NLP on improving primary schoolchildren's difficulties and challenges

Table 2 compares parents' answers to statements related to their children's emotional symptoms, conduct problems, hyperactivity, and peer problem scale before (controls) and after (cases) the NLP intervention. Regarding the emotional symptoms scale, parents claimed a significant decrease in their children complaining of headaches, stomachaches, or sickness after the intervention (controls = 0.45, cases = 0.31; $p = 0.018$). There was no significant change in children appearing worried (cases = 0.71, controls = 0.61; $p = 0.181$). Parents noted a significant decrease in their children feeling unhappy, depressed, or tearful post-intervention (cases = 0.27, controls = 0.39; $p = 0.045$). A non-significant variation was reported in the statement related to children being nervous or clingy in new situations or quickly losing confidence (cases = 0.55, controls = 0.54; $p > 0.05$). Regarding the conduct problem scale, after the intervention, slightly more parents considered that their child often loses temper (0.50 vs. 0.47; $p = 0.614$). Similarly, there was no significant difference between cases (0.36) and controls (0.46) in the statement "Generally well-behaved, usually does what adults request" ($p = 0.310$). Parents observed a significant decrease in children frequently fighting or bullying other children (cases = 0.19, controls = 0.31; $p = 0.033$). Although parents noticed a decline in children lying or cheating (cases = 0.27, controls = 0.33), this change was not statistically significant ($p = 0.35$). There was no difference in the statement related to children stealing from home, school, or elsewhere (cases and controls = 0.06; $p = 0.828$). Concerning their responses to the hyperactivity statements, parents reported decreased children's restlessness and over-activity with no significant differences (cases = 0.72, controls = 0.77; $p = 0.503$). Parents also observed a reduction in children constantly fidgeting or squirming (cases = 0.38, control = 0.5) with no statistical significance ($p = 0.077$). Parents noted a decline in statements related to children's difficulties in being easily distracted, thinking things through before acting, and maintaining a good attention span (controls: 0.82, 0.69, and 0.53, cases: 0.79, 0.62, and 0.46), with no statistical significance ($p > 0.05$). Regarding peer problem statements, the results indicated an increase in the statement related to children who prefer clarity (cases = 0.65, controls = 0.48; $p = 0.055$). There was a decrease in the

number of children with at least one good friend (controls = 0.41, cases = 0.29), but this change was not statistically significant ($p = 0.128$). Post-intervention, other children perceived children as less liked than controls (cases = 0.26, controls = 0.38, $p = 0.023$). There was no significant difference in parents' responses to their children being picked on or bullied by other children (controls = 0.54, cases = 0.47, $p = 0.365$). Cases were more likely than controls to report that their children got along better with adults than with other children (cases = 0.92, controls = 0.78, $p = 0.050$).

Table 2. Comparison of parents' answers to statements related to their children's emotional symptoms, conduct problems, hyperactivity, and peer problem scale before and after the NLP intervention.

	Pre-intervention	**Post-intervention**	
Emotional symptoms scale	**Mean (SD)**	**Mean (SD)**	***p*-value**
Often complains of headaches, stomachaches, or sickness.	0.45 (0.66)	0.31 (0.59)	0.018
Many worries or often seems worried.	0.71 (0.70)	0.61 (0.68)	0.181
Often unhappy, depressed, or tearful.	0.39 (0.62)	0.27 (0.56)	0.045
Nervous or clingy in new situations, easily loses confidence.	0.54 (0.74)	0.55 (0.71)	0.906
Many fears, easily scared.	0.79 (0.76)	0.66 (0.71)	0.140
Total score	2.85 (2.39)	2.35 (2.29)	0.007
Conduct Problem Scale	Mean (SD)	Mean (SD)	*p*-value
Often loses temper.	0.47 (0.66)	0.50 (0.62)	0.614
Generally well-behaved, usually does what adults request.	0.43 (0.62)	0.36 (0.58)	0.310
Often fights with other children or bullies them.	0.31 (0.56)	0.19 (0.42)	0.033
Often lies or cheats.	0.33 (0.53)	0.27 (0.51)	0.357
Steals from home, school, or elsewhere.	0.06 (0.30)	0.06 (0.31)	0.828
Total score	1.65 (1.80)	1.36 (1.41)	0.074
Hyperactivity Scale	Mean (SD)	Mean (SD)	*p*-value
Restless, overactive, cannot stay still for long.	0.77 (0.76)	0.72 (0.75)	0.503
Constantly fidgeting or squirming.	0.50 (0.66)	0.38 (0.56)	0.077
Easily distracted, concentration wanders.	0.82 (0.74)	0.79 (0.78)	0.682
Thinks things out before acting.	0.69 (0.67)	0.62 (0.69)	0.288
Good attention span sees chores or homework through.	0.53 (0.65)	0.46 (0.54)	0.288
Total score	3.27 (2.38)	3.00 (2.16)	0.185
Peer Problem Scale	Mean (SD)	Mean (SD)	*p*-value
Rather solarity and prefers to play alone.	0.48 (0.68)	0.65 (0.82)	0.055
Has at least one good friend	0.41 (0.65)	0.29 (0.57)	0.128
Generally liked by other children.	0.38 (0.56)	0.26 (0.48)	0.023
Picked on or bullied by other children	0.54 (0.68)	0.47 (0.62)	0.365
Gets along better with adults than with other children	0.78 (0.75)	0.92 (0.73)	0.050
Total score	2.63 (1.71)	2.60 (1.82)	0.887

Results are presented through Frequency (Percentages) or Mean (Standard Deviation). $p < 0.05$ are presented in bold and represent statistically significant differences.

The classification of scores, representing the degree of significant clinical problems before and after the NLP intervention, is outlined in **Table 3.** Before the intervention, over half of the students were unlikely to have clinically significant problems across all groups, with particularly higher frequencies of

closer-to-average scores in the hyperactivity (80.6%) and conduct problems (75.5%) categories. However, a slightly elevated risk was observed in 30.2% of students concerning the peer problems category and 20.0% in the emotional problems category. Nevertheless, after the intervention, a marginal decrease in the peer problem category was observed (cases (48.1%) vs. controls (50.9%)). Furthermore, there was an increase in the prevalence of substantial risks associated with clinically significant problems, primarily in the peer problems category (cases = 34.9%, controls = 30.2%).

Table 3. Classification of scores based on the rising degree of clinically significant problems before and after the NLP intervention

	Close to Average	**Slightly raised**	**High**
Pre-intervention	**Clinically significant problems are unlikely**	**May reflect clinically significant problems**	**Substantial risk of clinically significant problems**
Emotional symptoms score (*N* = 100)	65 (65.0%)	15 (15.0%)	20 (20.0%)
Conduct problem score (*N* = 102)	77 (75.5%)	9 (8.8%)	16 (15.7%)
Hyperactivity score (*N* = 103)	83 (80.6%)	8 (7.8%)	12 (11.7%)
Peer problem score (*N* = 106)	54 (50.9%)	20 (18.9%)	32 (30.2%)
Total difficulties score (*N* = 92)	67 (72.8%)	6 (6.5%)	19 (20.7%)
	Close to Average	Slightly raised	High
Post-intervention	Clinically significant problems are unlikely	May reflect clinically significant problems	Substantial risk of clinically significant problems
Emotional symptoms score (*N* = 100)	72 (72.0%)	12 (12.0%)	16 (16.0%)
Conduct problem score (*N* = 102)	80 (78.4%)	12 (11.8%)	10 (9.8%)
Hyperactivity score (*N* = 103)	87 (84.5%)	8 (7.8%)	8 (7.8%)
Peer problem score (*N* = 106)	51 (48.1%)	18 (17.0%)	37 (34.9%)
Total difficulties score (*N* = 92)	71 (77.2%)	8 (8.7%)	13 (14.1%)

Results are presented through Frequency (Percentages).

Table 4 depicts the correlation between study features and scores before and after the NLP intervention. Pre-NLP, increasing student age was correlated with higher emotional, conduct, and hyperactivity scores (0.101, 0.131, 0.109). Post-NLP, these correlations reversed (−0.034, −0.080, −0.055), with no significant change in peer problem scores (−0.060 vs. 0.085). Sex influenced emotional scores positively pre-NLP (0.203) and negatively post-NLP (−0.035). It also affected conduct and hyperactivity scores, with higher pre-NLP values. Parental age correlated with emotional scores more in pre-NLP (−0.071, post-NLP −0.161). The relationship with the student showed increased emotional and conduct scores post-NLP. Student grades were correlated with decreased emotional, conduct, and hyperactivity scores post-NLP. Marital status influenced emotional and hyperactivity scores less pre-intervention. Education level positively affected emotional and hyperactivity scores pre-NLP but negatively post-NLP. Working status had a negative pre-NLP correlation and a positive post-NLP correlation across all scores. The total number of children correlated negatively with emotional scores pre- and post-NLP.

Table 5 comprehensively compares parents' answers to statements related to their children's prosocial behavior before and after intervention. Regarding the statement on being considerate of other people's feelings, there was an increase in scores after the intervention (1.62 to 1.7; $p = 0.200$). Parents reported a slight decrease in their children's readiness to share with others, with no statistically significant differences (1.68 to 1.64; $p = 0.437$). There was no difference in children's behavior regarding helping others when they are hurt, upset, or feeling ill (1.51). Parents perceived an increase in their children's

helpfulness towards younger children and their willingness to volunteer to assist others (1.79 to 1.86, and 1.69 to 1.7, respectively), with no statistical significance ($p > 0.05$). After the intervention, a greater percentage of students were classified as unlikely to have clinically significant problems (89.3% vs. 95.1%). There was a decrease in the percentages of students classified as having slightly clinically significant problems and those at low substantial risk of clinically significant problems (5.8% vs. 2.9% and 4.9% vs. 1.95%, respectively).

Table 4. Correlation between study features and the different scores before and after the intervention.

Feature	Correlation	Emotional symptoms	Conduct problem	Hyperactivity score	Peer problem
Age of the student	Pre-NLP	0.101	0.131	0.109	−0.060
	Post-NLP	−0.034	−0.080	−0.055	−0.085
Sex	Pre-NLP	0.203*	0.195*	0.055	−0.089
	Post-NLP	−0.035	0.151	−0.049	−0.065
Age of the parent	Pre-NLP	−0.071	−0.197*	−0.260**	−0.114
	Post-NLP	−0.161	−0.105	−0.111	−0.080
Relationship with the student	Pre-NLP	0.067	0.120	0.011	−0.050
	Post-NLP	0.224*	0.162	0.129	0.089
Grade	Pre-NLP	0.092	0.137	0.045	−0.057
	Post-NLP	−0.022	−0.042	−0.041	−0.163
Marital status of the parents	Pre-NLP	0.035	−0.040	0.040	0.069
	Post-NLP	0.179	−0.076	0.076	0.032
Highest level of education	Pre-NLP	0.086	0.110	0.124	−0.187*
	Post-NLP	−0.023	0.020	−0.078	0.112
Economic situation	Pre-NLP	−0.102	−0.104	−0.121	−0.056
	Post-NLP	−0.105	−0.078	−0.120	0.214*
Working status	Pre-NLP	−0.064	−0.067	−0.054	−0.088
	Post-NLP	0.089	0.034	0.138	0.006
Total number of children	Pre-NLP	−0.143	0.053	−0.048	−0.119
	Post-NLP	−0.135	0.194*	0.021	−0.086

Significance was assessed through the Pearson correlation test. *$p < 0.05$; **$p < 0.001$.

Table 5. Comparison of parents' answers to statements related to their children's prosocial behavior before and after intervention.

	Pre-intervention	**Post-intervention**	
Prosocial scale	**Mean (SD)**	**Mean (SD)**	***p*-value**
Considerate of other people's feelings.	1.62 (0.56)	1.70 (0.49)	0.200
Shares readily with other children.	1.68 (0.56)	1.64 (0.54)	0.437
Helpful if someone is hurt, upset, or feeling ill	1.51 (0.75)	1.51 (0.72)	0.998
Kind to younger children	1.79 (0.53)	1.86 (0.40)	0.195
Often volunteers to help others	1.69 (0.54)	1.73 (0.44)	0.482
Total score	8.23 (1.94)	8.43 (1.61)	0.338
	Close to average	Slightly low	Low
	Clinically significant problems are unlikely	May reflect clinically significant problems	Substantial risk of clinically significant problems
	Frequency (%)	Frequency (%)	Frequency (%)
Pre-intervention	92 (89.3%)	6 (5.8%)	5 (4.9%)
Post-intervention	98 (95.1%)	3 (2.9%)	2 (1.9%)

Results are presented through Frequency (Percentages) or Mean (Standard Deviation). $p < 0.05$ are presented in bold and represent statistically significant differences.

4. Discussion

In the present study, NLP intervention significantly decreased headaches, stomachaches, and other illness. An earlier study in Germany revealed an improvement in the daily function of migraine patients after receiving an interdisciplinary outpatient therapy program[19]. While medical treatments like medications and procedures are often essential, non-medical interventions can complement these approaches and contribute to a holistic pain management strategy[20]. Since students might fake pain for various reasons, from seeking attention to avoiding certain activities[21], adopting low-cost non-interventional studies can help mitigate and resolve potential concerns. Analysis disclosed a significant reduction in the depressive symptoms of children after the NLP intervention. Comparable results were shown in an earlier study reporting a decrease in the depressive symptoms of children after receiving a transdiagnostic emotional program[22]. NLP significantly diminished the total emotional difficulties; thus, the emotional symptoms scale of schoolchildren improved after the intervention. Prior research showed that NLP effectively reduced competitive state anxiety in athletes by employing promising strategies, as supported by interview sessions and quantitative analysis indicating successful coping with dysfunctional thoughts and emotional anxiety[23]. Although the results were not significant regarding the impact of NLP on the general conduct symptoms, for instance, lying, losing temper, and stealing from home, there was a significant reduction in bullying symptoms and fighting behaviors. Understanding and treating conduct problems can help reduce children's school dropout[24]. Since individuals who observe aggressive behaviors in youth are more prone to engaging in bullying themselves[25], NLP can be a supportive strategy to address such behavior. Moreover, NLP positively improved children's social behavior, in agreement with previous findings of its positive effect on children's behavior and academic performance[26].

The intervention positively impacted reducing hyperactivity among schoolchildren, although the decrease did not reach statistical significance. A prior study highlighted the positive effects of a multimodal treatment on academic performance, contrasting with the less impactful outcomes of pharmacological and non-pharmacological treatments in isolation[27]. Notably, NLP could prove beneficial as a complementary treatment since, following the intervention, children garnered increased peer approval, which could explain their diminished affinity with adults post-intervention. Following the intervention, there was an elevated occurrence of being unlikely to have and only slightly having clinically significant problems associated with the total difficulties score. Conversely, there was a decrease in the frequency of both slightly having and being at substantial risk for clinically significant problems. A recent study demonstrated the positive effects of a classroom-based psychological intervention on enhancing children's well-being and academic performance while reducing behavioral problems[28]. Before the intervention, there was a positive correlation between the age of the students and their emotional symptoms. However, post-intervention, the results demonstrated a reverse trend, showcasing a negative correlation between student age and emotional symptoms. A previous study in China revealed a heightened risk of emotional symptoms with increasing age[29]. Concerning hyperactivity, there was an inverse relationship between age and associated symptoms post-intervention, indicating a decrease in symptoms as age advanced. This contradicts an earlier study that showed a moderate correlation between age and hyperactivity[30]. Notably, females exhibited a higher prevalence of developing hyperactivity than males, a trend that diminished after the intervention. This aligns with findings from a prior study where females were likelier to encounter hyperactivity than males[31]. Family dissolution was found to impact peer problems in schoolchildren directly, and though the results showed a decrease post-intervention, it did not reach statistical significance. A recent study highlighted the negative impact of family separation

on the social well-being of children at school[32], suggesting the beneficial impact of NLP as an adjunctive therapy for children at risk.

While this study contributes valuable insights into the challenges faced by schoolchildren from the perspective of parents, it is imperative to acknowledge and address the various limitations inherent in the research design. The relatively small number of participants may not fully capture the diversity and nuances of experiences that could be present in a larger and more heterogeneous population. Furthermore, environmental factors, as well as social and cultural forces, are critical determinants that shape the educational landscape. The study was confined to the context of Lebanon, and the intricate interplay of these factors may differ significantly in other countries. As such, the generalizability of our findings to diverse cultural and educational settings may be limited. The exclusive focus on a single private school in Lebanon also introduces a degree of specificity that may restrict the applicability of our results to a broader educational context. Private and public schools may exhibit distinct dynamics, and the unique characteristics of the chosen institution may not necessarily mirror the challenges faced by students in other educational settings. Another potential source of bias in our study is the selective criteria employed in participant recruitment, particularly in age and grade specifications. By concentrating on a specific demographic, there is a risk of overlooking the experiences of individuals outside these parameters. To mitigate this bias, comprehensive training sessions were conducted for data collectors, emphasizing the importance of impartiality and the need to capture a representative spectrum of perspectives. It is important to highlight that this research represents a pioneering effort in investigating the difficulties encountered by schoolchildren from the vantage point of parental perspectives. While this novelty contributes to the originality of our study, it also implies a lack of established benchmarks for comparison. Future studies, building upon our foundational work, should seek to replicate and expand upon our findings to enhance the robustness and generalizability of the insights garnered. Further research could examine the cultural adaptation and contextualization of NLP principles and techniques in diverse educational settings, including Lebanon. Investigating how NLP can be tailored to accommodate cultural norms, values, and linguistic diversity can inform culturally responsive teaching practices. By conducting further research in these areas, educators, policymakers, and researchers can gain a deeper understanding of how NLP can be effectively applied in educational settings to promote student success, foster inclusive learning environments, and support holistic development.

5. Conclusion

The present study demonstrates the significant positive impact of NLP intervention on various health aspects, including a reduction in headaches, stomachaches, and sickness, as well as improvements in children's emotional well-being, social behavior, and academic performance. The findings support the idea that non-medical interventions, such as NLP, can complement traditional medical treatments in a holistic pain management strategy. Notable positive outcomes include a decrease in bullying and fighting behaviors, as well as a potential reduction in hyperactivity among schoolchildren, with associated benefits in peer approval. The study suggests age-related changes in emotional and hyperactivity symptoms post-intervention and highlights the potential of NLP as an adjunctive therapy, particularly for children at risk due to family dissolution. While the results are promising, further research is needed to confirm the long-term efficacy and general applicability of NLP interventions.

Author contributions

Conceptualization, GH; methodology, IN and GH; validation, AEK and GH; formal analysis, HC,

MC and HA; investigation, HC, MC and HA; resources, IN and GH; data curation, HC, MC and HA; writing—original draft preparation, HC, MC and HA; writing—review and editing, IN, AEK and GH; visualization, IN and AEK; supervision, GH; project administration, GH. All authors have read and agreed to the published version of the manuscript.

Ethics approval and consent to participate

The study protocol, questionnaire, and consent form were reviewed and approved by the scientific committee of the Lebanese University, Faculty of Pharmacy (reference: 3/23/D). Written informed consent was obtained from every participant's parent/legal guardian.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Acknowledgments

We would like to acknowledge the valuable guidance and support of the school's direction: Sr Hyam Sawiry (Superior of the School) and Nicole Choueïry (Responsible for the primary cycle). We also express gratitude for the collaboration of teachers, students, and their parents.

Conflict of interest

The authors declare no conflict of interest.

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