

DAVID SPINE CONCEPT AND MEDICAL OUTCOMES STUDY QUESTIONNAIRES TO ASSESS ADOLESCENT PATIENTS HAVING BACK PAIN

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Abstract

The objective of this study was to investigate the effectiveness of DAVID Spine exercises program on the overall health of the selected patients using a specific survey. The World Health Organization describes adolescence as “young people between the ages of 10 and 19 years” [1] Adolescent back pain has been reported to be as common as that of adult populations [2][3][4] and has been attributed to several factors such as gender, age, sitting for long periods, working at computers, school seating and psychological factors [5-10]. Based on this premise, 11 female participants (n=11), aged between 12 and 17 years, who have frequently experience back pain and have no previous experience in physical training, were included in this study. The research began with the hypothesis that implementing personalized physical exercises program using DAVID Spine Concept devices [11] it can enhance strength of the muscle responsible for supporting the spine, improve joint mobility, it reduces the back pain and overall enhance quality of life. To validate the principles set in the purpose and tasks of this study, we used a Visual Analog Scale (VAS) for pain and a standard medical outcomes questionnaire (Short Form-36), provided by DAVID-EVE software library.

Key Word:s DAVID devices, back pain, physical exercise program, questionnaire method.

INTRODUCTION

Back pain is a common and serious health problem, being among the most frequent causes of disability in the world. Regarding the prevalence of back pain, numerous studies have shown that up to 70% of the world's population has experienced back pain at least once in their lifetime.

About 40% had an episode that lasted more than a day in the last 12 months and about 20% had an episode of pain in the last 3 months [11].

The pain will cause the avoidance of physical activity thus leading to a decrease in the strength and coordination of the spinal muscles resulting in damage to the integrity of the structural tissue of the back. This creates a vicious cycle that leads to more pain and the loss of functionality of the spine, even leading to psychological effects. If this stage is reached, the traditional methods of treatment become useless and with time, the possibility of permanent disability increases significantly and quality of life decreases.

In the 21st century, the prevalence of back pain in young people is comparable to that observed in older individuals, primarily due to sedentary lifestyles and everyday activities. The flexibility of the spine and the strength of its supporting muscles are crucial for maintaining the spine's shock-absorbing capacity and protecting it against diseases and accidents. To maintain mobility, it is necessary to actively use joints and train both abdominal and back muscles to ensure their strength. Therefore, it is crucial to follow a physical exercise program, which involves the use of specialized devices and personalized exercises under physiotherapist surveying. Various apparatus and devices are highly effective for enhancing spinal functionality and treating various spinal problems, and their selection is contingent upon the specific evaluation of the patient and the advice of the specialist physician in collaboration with the physiotherapist.

Numerous studies and research have been conducted about using specific devices to maintain and balance spinal muscular strength through physical activities. [12][13][14]. Other studies have shown that physical exercise can be the treatment solution for spine health [15-18].

It is crucial to acknowledge that there is a wide variety of technologies and techniques used to achieve this objective, and outcomes may differ based on the specific patient's condition and requirements.

MATERIALS AND METHODS

In this paper, we considered necessary to use the following research methodology: review of specific literature, the experimental treatment program with DAVID equipment's, the questionnaire method (pain questionnaire with visual analogue scale - VAS and a standard medical outcomes questionnaire Short Form-36 for health quality, the DAVID-EVE software for mathematical statistic method and the graphic representation).

The developed experimental training program was applied on a focus group having 11 female persons (N=11) aged between 12 - 17 years (Tabel 1). The patient's involvement was voluntary,

based on ethical considerations, all of patients and their parents provided consent by signing an informed consent declaration.

Table 1 Structure of subjects for the focus group

No .	Patient (code)	Sex	Physiological parameters					
			Age	Height (cm)	Weight (Kg)	Upper body weight (Kg)	Head weight (Kg)	Body mass index BMI (Kg/m ²)
1	CI	F	13	157	35	24.2	4.7	14.2
2	SE	F	15	167	47	30.2	4.8	16.9
3	PE	F	12	160	50	29.7	4.7	19.5
4	ZA	F	17	177	49	33.0	5.0	15.6
5	CB	F	13	137	43	22.5	4.4	22.9
6	FA	F	13	146	56	28.6	4.5	26.3
7	DI	F	12	141	32	19.7	4.5	16.1
8	TA	F	16	167	54	32.5	4.8	19.4
9	UL	F	15	173	57	34.8	4.9	19.0
10	ME	F	13	158	76	37.7	4.7	30.4
11	BN	F	14	173	65	37.4	4.9	21.7

The present study was conducted at the Dazen Spine - Kinetic Constanta, a center for diagnostic, training, therapy, and recovery of musculoskeletal problems, located in Constanța. This center is equipped with DAVID devices (G-LINE) that are high quality medically certified and well-designed devices for the treatment of musculoskeletal problems, especially for the prevention, treatment, and rehabilitation of back problems. The state-of-the-art exercise equipment is manufactured in Finland (Europe) and is supported by various validation and outcome based scientific articles [11]. The David Spine Concept encourages and implements digital spine therapy using computer-controlled physical activities to restore strength of spinal muscle and joint mobility function. DAVID Spine Concept, equipped with cutting-edge technology and data-driven solutions, is pivotal in transforming exercise therapy and delivering targeted personalized, measurable patient interventions [11].

With the DAVID Spine Concept (G110, G120, G130, G140, and G150 devices) and DAVID-EVE (Evaluated Exercise) software objective measurements can be made using mobility and isometric strength testing. The tests are compared with DAVID reference data (Ref.) and the values can be converted into various diagnosis-based training templates.

The focus subjects started this program with an anamnesis that confirmed to us that all participants have daily occupations in which they excessively demand the lumbar and cervical area of the spine, and that none of them took part in any physical activity organized in the last two months.

To establish the individual treatment program, it was necessary to know the patient's current state, capacity, and physical condition. A standard evaluation protocol involves an initial validated pain questionnaire (Figure 1) through the visual analogue scale (VAS), also includes the stage of pain, the spine profile, posture, functional impairments, limitations, and self-assessment (Baseline).

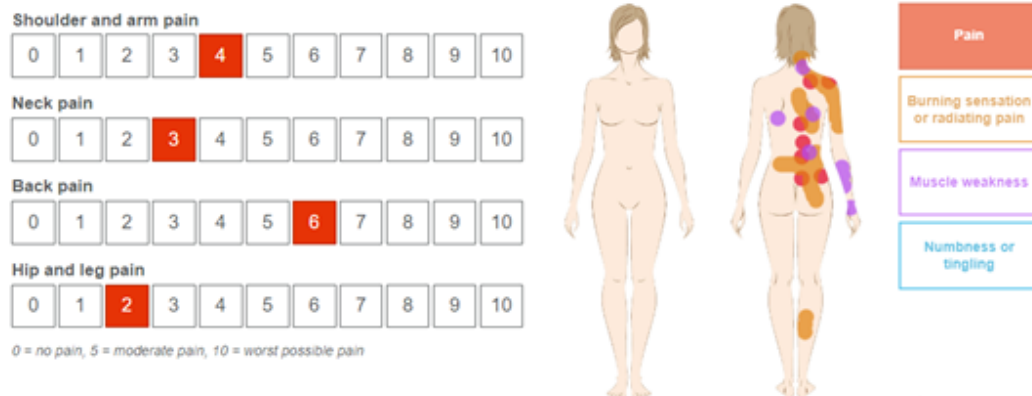


Figure 1 VAS pain questionnaire (Baseline)

The optimal duration of a DAVID physical exercises program is limited to a maximum of 12 weeks, with a frequency of 2-3 sessions per week, resulting in a total of 24 sessions. The therapeutic program is segmented into four stages (Figure 2), each with distinct aims.

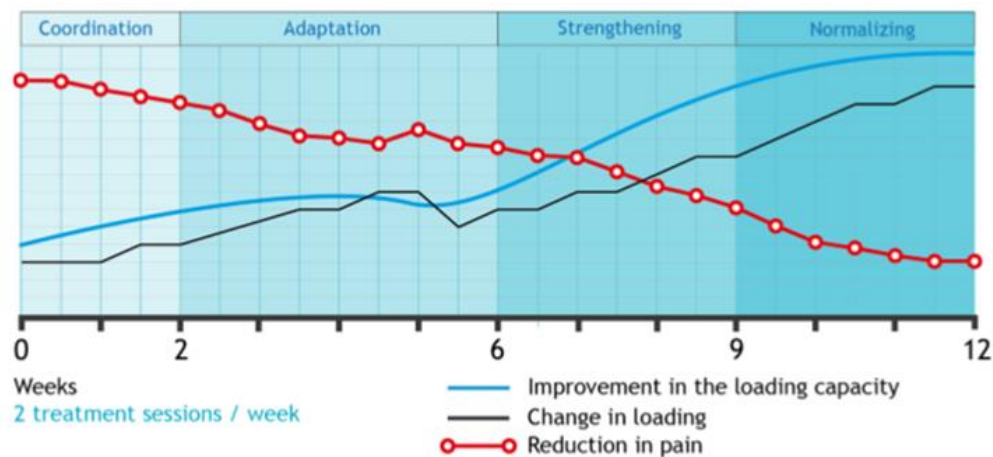


Figure 2 Individualized treatment program [11]

Upon the conclusion of the treatment program consisting of 24 training sessions, the participants involved in the program had an evaluation of their mobility and maximum isometric strength (Outcomes) using the same methodology. The specific objectives of the physical exercises program with DAVID devices were to enhance the mobility and strength of the spine in a safe and controlled way, ultimately aiming to restore the structural integrity of the spine.

The overall goal of successful treatment is to reduce perceived pain and increase quality of life. To achieve this goal, active therapy must be progressive and in line with the individual's ability to adapt to the changes.

The instruments used for survey evaluations have included the questionnaire on the clinical data, added to the systematic pain evaluation through the Visual Analogue Scale (VAS), and quality of life through the Short Form Health Survey tool (SF-36).

The assessment tool called “Short Form Health Survey” (SF-36) is a multidimensional general quality of life questionnaire, consisting of 36 items divided in 8 scales or domains: functional capacity (10 items), physical aspects (4 items), pain (2 items), general health status (5 items), vitality (4 items), social aspects (2 items), emotional aspects (3 items), mental health (5 items) and a comparative question between the current health status and those of one year before [19].

RESULTS AND DISCUSSION

A systematic assessment of the attained outcomes is conducted following the DAVID treatment program: clinical assessment, measurements (mobility, strength, and strength correlation), and questionnaires that involve subjective opinions or experiences.

As a result of the physical exercise program carried out with the DAVID device system, The VAS-back intensity pain profile (Figure 3) is a highly helpful tool for showcasing the improved functionality of the patient.

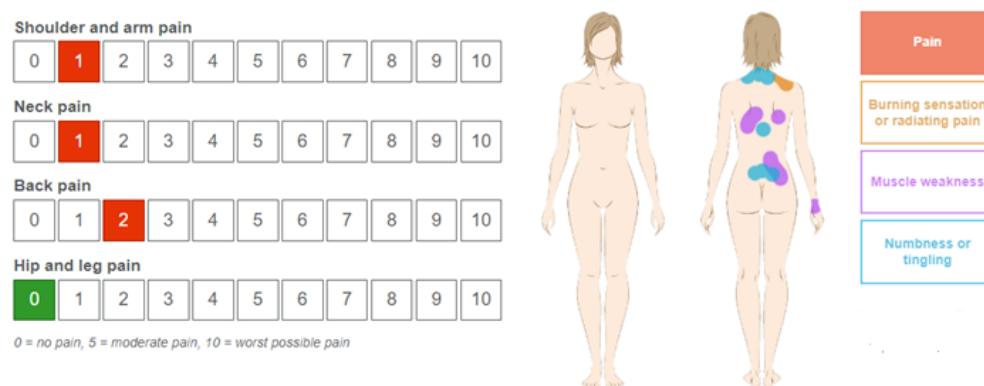


Figure 3 VAS - Pain questionnaire (Outcomes)

The back pain profile tracking graph (Figure 4) generated by the DAVID-EVE software after only 4 weeks of physical exercise program clearly shows significant differences between the outcomes obtained - Test Evaluation (Outcomes) compared to the - Initial Evaluation (Baseline). From the figure below it is clear to observe a pain reduction with 67%.

Test results

Date	Shoulder and arm	Neck	Back	Hip and leg	Pain reduction
2023-01-05 (Baseline)	4	3	6	2	67%
2023-01-29 (Outcome)	1	1	2	0	

Session pain tracking

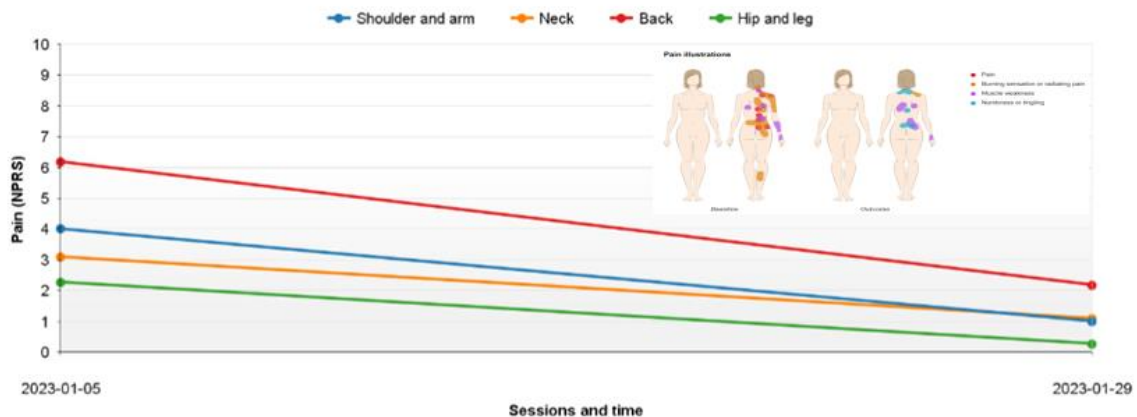


Figure 4 Back Pain Profile tracking.

To provide a more accurate and clear presentation of the results obtained from statistical analysis of the data on progress achieved for each parameter analyzed, as well as to emphasize the effectiveness of the DAVID devices in maintaining and balancing spinal muscle strength, we have decided to include the outcomes of SF-36 questionnaire.

Results

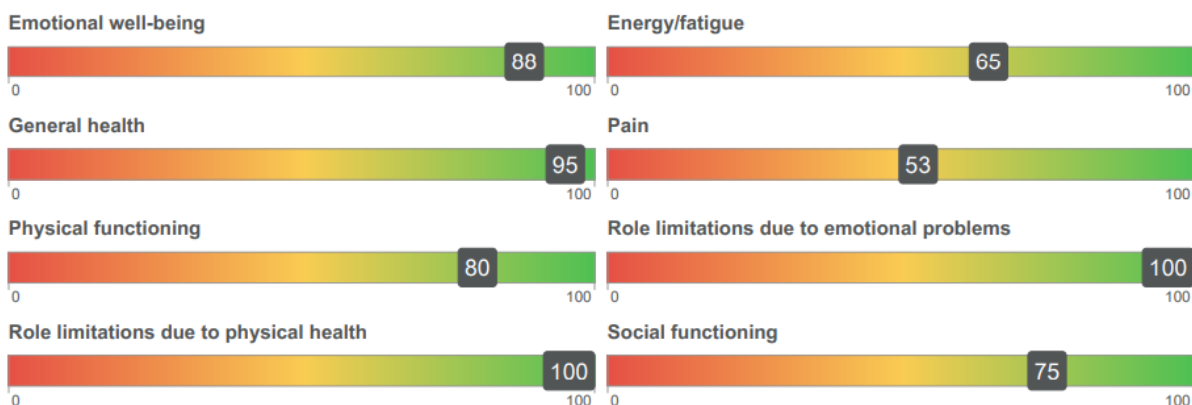


Fig. SF-36 Questionnaire report and results

The SF-36 has eight scaled scores. The scores are weighted sums of the questions in each domain. Scores range from 0-100, where lower scores mean more disability and higher scores mean less disability. At the analysis of the SF-36 questionnaire we observed that general health, physical and emotional aspect status showed a statistically significant improvement (80-100%) to the initial evaluation. On the other hand, the pain and energy aspects domain present good statistically significant improvement (53-65%) at 4 weeks assessment, that meanings to continue the DAVID physical exercises program to a maximum of 12 weeks, which is essential

for supporting, maintaining, and promoting balanced development of the musculoskeletal system in individuals, as well as ensuring their long-term health.

CONCLUSIONS

The effectiveness of the DAVID system for improving spinal disorders has been shown worldwide, with numerous specialized centers using this innovative concept that is medically certified. At the national level, we are at the beginning of the implementation and especially of the application of this technology based on automatic calculation algorithms, artificial intelligence (AI) and machine learning. This study included adolescent female participants, who had no prior physical training and commonly had back pain. These participants have adopted an incorrect posture in both their daily activities and leisure time. Individual physical exercises program was implemented using the specialized DAVID SPINE concept devices. This program focused on improving joint mobility, balancing spinal muscle strength, correcting body posture, decreasing back pain and overall enhancing quality of life. The DAVID-EVE software developed a graphic back pain profile by comparing the values obtained at the initial assessment (baseline) and the test evaluation (outcomes) through the Visual Analogue Scale (VAS) of pain questionnaire. The outcome pain tracking profile provides invaluable information in demonstrating the restored function of the patients. The effectiveness of the physical exercises conducted using the DAVID devices is confirmed by the decrease of back pain (67%). Also, this study has demonstrated that the SF-36 medical outcomes questionnaire can be used to determine the results of treatment in adolescent patients with back pain. Additionally, certain parameters show significant increases, which is essential for supporting, maintaining, and promoting balanced development of the musculoskeletal system in individuals, as well as ensuring their long-term health. The therapy program implemented during the short evaluation period (only 4 weeks) using the DAVID SPINE system demonstrated its effectiveness, therefore confirming the hypothesis.

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