

Effects of a Humor Therapy Program on Stress Levels in Pediatric Inpatients

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OBJECTIVE: Disease and hospitalization generate stress, which can affect the response to treatment. Humor has been used in many hospitals to decrease stress. The aim of this study was to evaluate the impact of a humor therapy program on stress levels in pediatric inpatients.

ABSTRACT

METHODS: In the first phase, an intervention and a control group were studied over 2 consecutive 3-month periods; the interventions were performed by a team of artists trained in humor therapy. Salivary cortisol levels were measured by enzyme-linked immunosorbent assay, and the Weisz test, a pictorial chart that determines subjective stress perception, and the Parker test, which assesses objective stress, were applied. In the second phase, salivary cortisol levels were measured and the Weisz test was administered before and after the interventions.

RESULTS: A total of 306 patients were recruited into this study: 198 in the first phase (94 in the intervention group and 104 in the nonintervention group) and 108 in the second phase. There were no differences between groups regarding age, sex, or medical diagnosis. The children in the intervention group presented lower cortisol levels, lower scores on the Parker test, and higher scores on the Weisz test than children in the nonintervention group. In the second phase, the children showed lower salivary cortisol levels and higher scores on the Weisz test after the intervention.

CONCLUSIONS: Humor therapy has beneficial effects on stress and cortisol levels in pediatric inpatients. This supports the implementation and reinforcement of these therapies in pediatric hospitals.

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Dr Sánchez conceptualized and designed the study, supervised the interventions, coordinated data collection, reviewed the analysis, and reviewed the manuscript; Drs Echeverri, Londoño, Ochoa, Quiroz, Romero, and Ruiz collected the samples, coordinated the interventions, carried out the initial analyses, and drafted the initial manuscript; and all authors approved the final manuscript as submitted.

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Psychological processes may regulate the immune response, and affection, well-being, and self-confidence can be significant factors for recovery and response to treatment, especially in children.¹ Disease is an important factor that produces stress, and hospital environments, diagnostic tests, and medical treatments can further increase the overload that a patient experiences.² This effect is even more pronounced in children,³ who require effective strategies to help them cope with hospitalization and to avoid stress-related disorders.⁴ The therapeutic value of humor and laughter is recognized in all cultures and latitudes,⁵ but unfortunately, not enough scientific evidence is available to support these benefits in health care. Berk et al^{6,7} demonstrated that humorous experiences increase cellular immune responses and decrease the level of stress markers; laughter increases the activity of killer lymphocytes and immunoglobulin levels.⁸⁻¹³ In addition, laughing produces a number of beneficial systemic effects, such as muscle relaxation, increased oxygen saturation in the peripheral blood, decreased postprandial glycemia, and mobilization of respiratory secretions.^{10,14-17} Humor therapy has shown beneficial effects on a wide range of diseases, including cancer, diabetes, rheumatoid arthritis, Alzheimer disease, dental pathologies, renal diseases, and psychiatric disorders, and in the care of patients who are terminal.^{10,18-28} Humor also has been used as an adjuvant strategy for pain management.^{29,30} It has been demonstrated that undergoing a humorous experience can reduce the

discomfort generated by pain³¹ and increase the patient's response threshold³² in both adults and children.³³ Clown interventions improve mood, evidenced by nonverbal communication,³⁴ decrease pain,^{34,35} and increase clinical improvement.³⁵ Furthermore, clown interventions diminish preoperative anxiety in children undergoing penile surgery and lead to a shortening of the overall hospital stay time, thereby reducing the overall medical costs.³⁶ Humorous experiences decrease the level of stress markers in adults.⁶ Some hospitals use humor therapy,³⁷ and the perception of health personnel has been evaluated as positive in the development of these therapies.³⁸⁻⁴⁰ Children have been one of the groups in which the effects of humor therapy have been more thoroughly documented.⁴¹⁻⁴⁴ Humor also has been used as a tool to prepare children for a hospitalization or surgery,^{45,46} and this strategy has beneficial effects on the emotional responses of disabled children,⁴⁷ adolescents who are coping with stressful situations,⁴⁸ and children admitted to hospitals, as well as their parents.⁴⁹ However, there is little known about the effect of humor therapy or laughter on biological stress markers in children. The primary goal of this article was to assess the morning cortisol and before/after cortisol levels for children who were randomized to a humor intervention, compared with children who were not. A secondary goal was to assess the stress levels of these children by using validated caregiver-based and patient-based stress scores.

METHODS

Study Design and Subjects

This was an experimental study in 2 phases (Fig 1). This study was performed on the pediatric ward of a university general hospital in Pereira, Colombia. Children were included in the study if they were 2 to 14 years old, hospitalized during the period of the study, and consented to participate. Consent was given verbally by the children and written consent was provided by the parents or guardians. The children who were excluded were those hospitalized in critical care wards, children who were taking steroids or had taken them in the 3 months before the study, children who required isolation because of the nature of their diseases, children who were unable to give saliva samples, and children with cognitive or visual disabilities. The length of hospitalization was not taken into account as an inclusion or exclusion criterion.

The first phase was a prospective nonrandomized nonblinded trial in which patients were placed into an intervention and a control group during two 3-month successive periods of hospitalization. The purpose of this first phase was to compare morning salivary cortisol levels in patients in the intervention and control arms. During the first 3 months, children were recruited into the control group and in the subsequent 3 months, children were recruited into the intervention group. This design was chosen because it was impossible to isolate a group of children from the humor therapy routines if they were present in the ward. The second phase

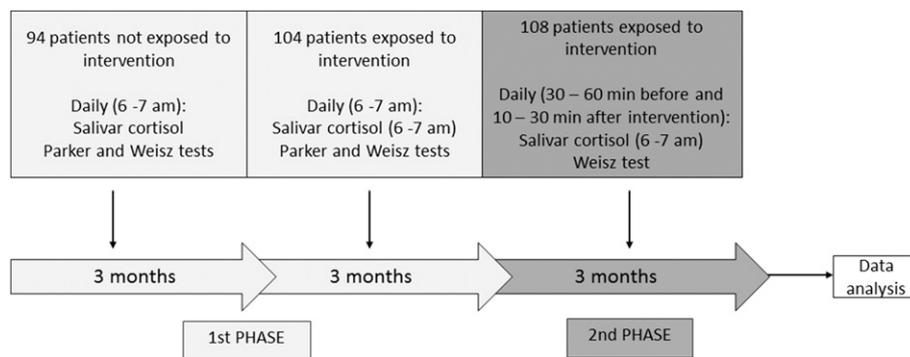


FIGURE 1 Study design.

was a cohort study in which all patients were enrolled in a humor intervention, and evaluated before and after the intervention. The intervention occurred >3 months after the first phase ended. Children were evaluated daily before and after the interventions.

All children were assessed daily, with the exception of Sundays.

Interventions

The interventions were performed by a group of artists trained in humor therapy techniques and the management of hospitalized children. The interventions were always administered through characters prepared after a number of workshops conducted by experts and were performed every day in the afternoons, with the exception of Sundays, during 3 consecutive months (78 interventions) for the intervention group in the first phase and during the subsequent 3 months (76 interventions) in the second phase; they were based on routines that had been previously rehearsed but were open to spontaneity because of the unpredictable situations created by the children. The intervention team was prepared to adapt to each patient's needs and to help each child to find his or her own way to have fun. The group of characters (between 6 and 8 each time) used different techniques, such as clowning, story-telling, theater, dance, puppets, magic, music, and personalized recreation, among other methods, to approach the children and interact with them. The duration of these sessions was between 2 and 3 hours, given the unpredictable and changing characteristics

of the target population. At all times, a plan to stop the intervention was established in case of patient rejection or medical emergency.

Salivary Cortisol Measurements

Samples of at least 500 μL saliva were obtained by using a pressed cotton ball placed in the patient's mouth for 3 to 5 minutes. In the first phase, the samples were obtained daily, with the exception of Sundays, between 6:00 and 7:00 AM after at least 8 hours of fasting and 30 to 60 minutes after waking. In the second phase, the samples were obtained daily between 2:00 and 3:00 PM, 30 to 60 minutes before the intervention and then 10 to 30 minutes after the intervention. The cotton was squeezed under aseptic conditions, and the saliva sample was collected in a plastic tube and then refrigerated (0–4°C) and carried to the laboratory where they were frozen at –20°C. Hormone levels were quantified by using a commercial kit (Salivary Cortisol Quantification Kit KAPDB290, DAsource Immunoessays SA, Louvain-la-Neuve, Belgium) to measure salivary cortisol by using an enzyme-linked immunosorbent assay technique. All measurements were performed in duplicate, and the recorded datum was the resulting average.

Evaluation of Emotional Stress

During the first phase of the study, to evaluate the level of stress, 2 strategies were used. The first strategy was the application of the test designed and validated by Parker et al⁵⁰ (Parker test) for hospitalized children, which assessed objective stress and consisted of 8 items that were completed by hospital staff, according to information given by parents

TABLE 1 Parker Test

Parameter
1. Appeared worried about many things.
2. Appeared miserable, unhappy, tearful, or depressed.
3. Shows little enjoyment in things.
4. Had tears about doing some things.
5. Has been irritable and quarrelsome.
6. Has been complaining of pains and aches.
7. Has been withdrawn and quiet.
8. Appeared forgetful and showed poor concentration.

and nurses (Table 1). A higher score indicates a higher level of stress. This test was validated by a Cronbach test applied to 20 children.

The second strategy used was the application of the Weisz pictorial test (Weisz test), designed and validated to be applied in children.⁵¹ This test consisted of 5 simple facial expression cartoons that represented emotional states ranging from great distress to great joy (Fig 2). Each one of these expressions was given a score between 1 and 5. The children chose by themselves 1 picture after being asked which of them best showed how they were feeling at the moment of the examination. A lower score implies a higher level of emotional stress and discomfort. This test was validated by a Cronbach test applied to 20 children.

Both tests were applied daily, after taking saliva samples, to all children included in the first phase of the study. With respect to the children in the second phase, only the Weisz test was applied 30 to 60 minutes before the intervention and again 10 to 30 minutes afterward. The Parker test

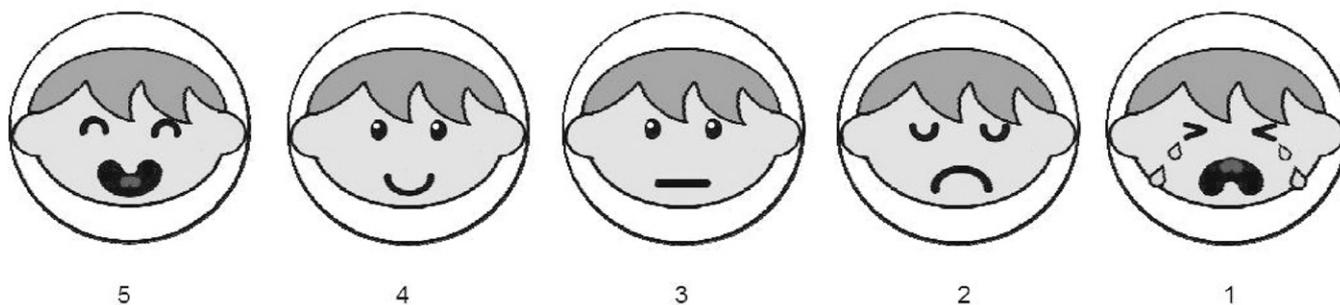


FIGURE 2 Weisz pictorial test.

was not applied in these children because it was not possible to observe any change in the scores in such a short period.

Data Analysis

The data were analyzed by using the statistical software SPSS 22.0 (IBM SPSS Statistics, IBM Corporation) and GraphPad 6.0 (GraphPad Software Inc., LaJolla, CA). The Mann-Whitney *U* test was used because of the non-normal distribution of the data. In addition, the Pearson linear correlation test was used to determine the level of correlation between the different variables.

Ethical Considerations

The study complies with the provisions of the Declaration of Helsinki and was approved by the Ethics Committee of the Universidad Tecnológica de Pereira.

RESULTS

In the first phase, 198 children were included. The control group included 94 children and the intervention group included 104 children. In the second phase, 108 children were recruited. No patients withdrew from the interventions or the study.

First Phase

There were no differences with respect to sex, age, or frequency of diagnosis type (Table 2) in the 2 groups. Regarding cortisol, the findings showed that the morning levels of this hormone were significantly higher in the children in the control group compared with the intervention group (Fig 3A).

The Parker test was validated in a pilot test with 20 children to assess its internal reliability, and the analysis revealed a Cronbach's α coefficient of 0.841, demonstrating a high reliability. The intervention group showed a significantly lower score than the control group, which reflected a lower level of stress in the intervention group of children (Fig 3B).

The Weisz test also was validated with 20 children, and the analysis yielded a Cronbach's α coefficient of 0.723, which was also qualified as high. The intervention group showed a significantly higher score than the control group, which is evidence of

a lower level of subjective distress in the intervention group (Fig 3C).

The cortisol levels were positively correlated with the scores on the Parker test ($r^2 = 0.94, P < .0001$) and inversely correlated with the scores on the Weisz test ($r^2 = -0.92, P < .0001$). In addition, the scores of both scales correlated inversely with one another ($r^2 = -0.95, P < .0001$).

No correlations were found between cortisol levels or the scores on both tests with respect to sex, age, or type of diagnosis for any of the groups (data not shown). The average number of samples and assessments from each patient were 4 ± 2 , which correspond to the length of stay in hospital.

Second Phase

There were no differences with respect to sex, age, or frequency of diagnosis type with respect to the children included in the first phase (Table 2). The cortisol levels before the intervention were significantly greater than the cortisol levels after the intervention (Fig 4A). The scores on the Weisz test were significantly lower in the children when the test was applied before the intervention compared with the scores when it was applied after the

intervention (Fig 4B). The cortisol levels were inversely correlated with the scores in the Weisz test ($r^2 = -0.96, P < .0001$).

DISCUSSION

The current study evaluated the impact of humor therapy on a hospitalized pediatric population in Colombia. The intervention methodology used has been implemented in a wide variety of geographic locations and in different cultural contexts,^{52,53} and hospital clowns have been demonstrated to be very useful in the therapeutic process for inpatients with regard to increasing their subjective well-being.^{54,55}

The results of the present work suggest that humor therapy has significant effects on salivary cortisol levels, which is an objective measurement of biological stress.⁵⁶ Cortisol has been used as a stress marker in a number of contexts, and its utility in this capacity has been proven in both adults^{57,58} and children.^{59,60} The levels of this hormone in saliva correlate with its respective plasma levels, and it is an excellent indicator of the secretion pattern of the hormone.⁶⁰ Although cortisol levels have circadian variations, the concentration in the morning 30 to 60 minutes after waking but before eating is considered to be a

TABLE 2 Comparison by Age, Sex, and Main Diagnoses Proportions Found in the Population Included in the Study

	First Phase			Second Phase	
	Nonintervention Group	Intervention Group	<i>P</i> ^a		<i>P</i> ^b
No. of patients	94	104		108	
Age, y, mean \pm SD	8.41 \pm 4.2	8.19 \pm 4.9	.766	7.3 \pm 3.7	.813
Length of stay, mean \pm SD	4 \pm 2	4 \pm 3	.892	3 \pm 4.2	.842
Sex, %					
Boys	65.2	58.5	.415	67.3	.568
Girls	34.8	41.5	—	36.7	—
More common diagnosis, %					
Fractures	24.6	23.4	.585	20.8	.421
Acute appendicitis	20.2	20.2	—	18.4	—
Type I diabetes	8.7	3.2	—	5.1	—
Urinary infections	2.9	5.3	—	3.6	—
Epilepsy	2.9	3.2	—	3.0	—

The comparison was established by means of the Mann-Whitney *U* test.

^a Note that there were no significant differences regarding any of these parameters in both groups in the first phase.

^b Note that there were no significant differences between the patients included in the first phase in comparison with those included in the second phase.

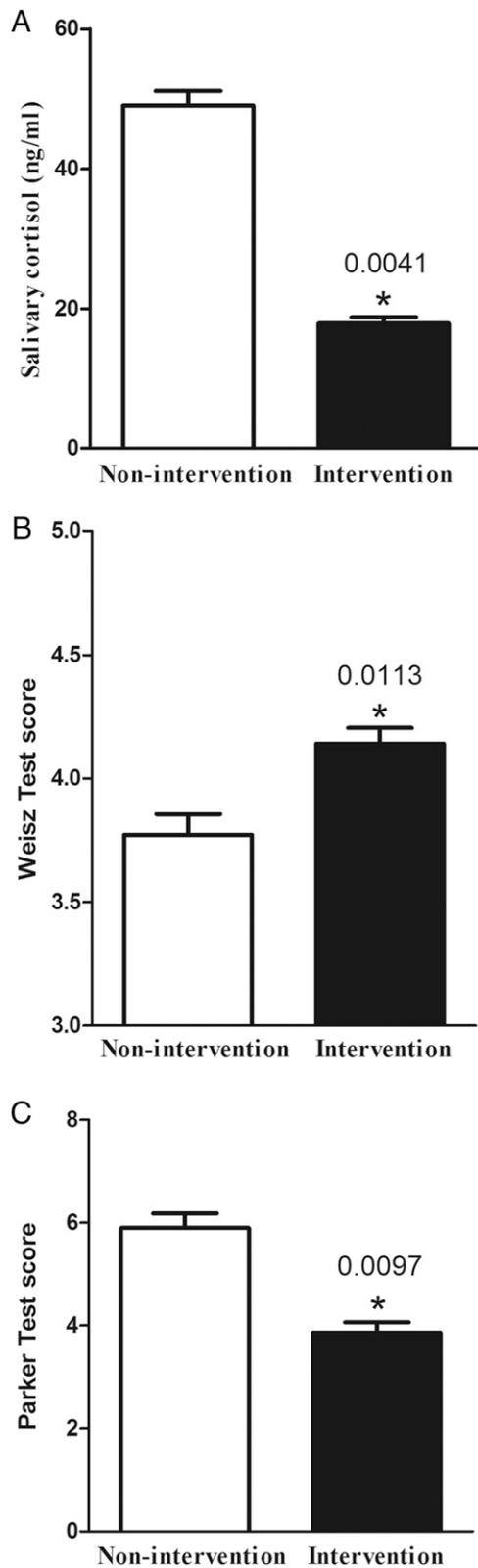


FIGURE 3 A, Comparison of cortisol levels between the nonintervention group ($n = 94$) and the intervention group ($n = 104$). B, Comparison of the scores in the Parker test in both groups. C, Comparison of the scores in the Weisz test between both groups. *Significant differences according to the Mann-Whitney U test.

good indicator of the functioning of the hypothalamus-pituitary-adrenal axis; usually the levels of cortisol increase during this period, and this increase is known as the cortisol-awakening response (CAR).^{61,62} The CAR is related to positive and negative attitudes, the grade of subjective optimism, and to the levels of acute or chronic stress to which the individual has been subjected.^{63–65} The findings of the current study support the hypothesis that humor therapy has beneficial effects on the biological stress demonstrated by the levels of the CAR.

Similarly, in the second phase of this study, cortisol levels measured after the interventions were significantly lower than the levels measured before the intervention, which suggests an effect of the humor therapy. Although these levels were determined in the afternoon (because the interventions could not be performed in the mornings for logistical reasons), and at that time of the day cortisol levels are lower than CAR, they constitute a reliable finding given that the baseline was the measurement before the intervention and the samples were taken in all the children at the same time. These findings agree with other studies in adolescents in which humorous interventions are related to a salivary cortisol decrease.⁶⁶

The Parker test was used to evaluate stress levels according to objective parameters. The scores were higher in children in the nonintervention group compared with children in the intervention group, which reflected increased stress during the period of hospitalization in the first group. These differences were significant and consistent with multiple reports of improvement in the grade of distress after similar interventions^{53,40–44,54,66–68}; however, unlike the current study, most of these previous reports were based on nonstandardized and subjective observations and did not use validated tests or objective hormone levels.

To complement the evaluation of the interventions on stress levels and considering that the quantification of this parameter is complex, this study also used the Weisz test, which had the advantage of being easy to apply and

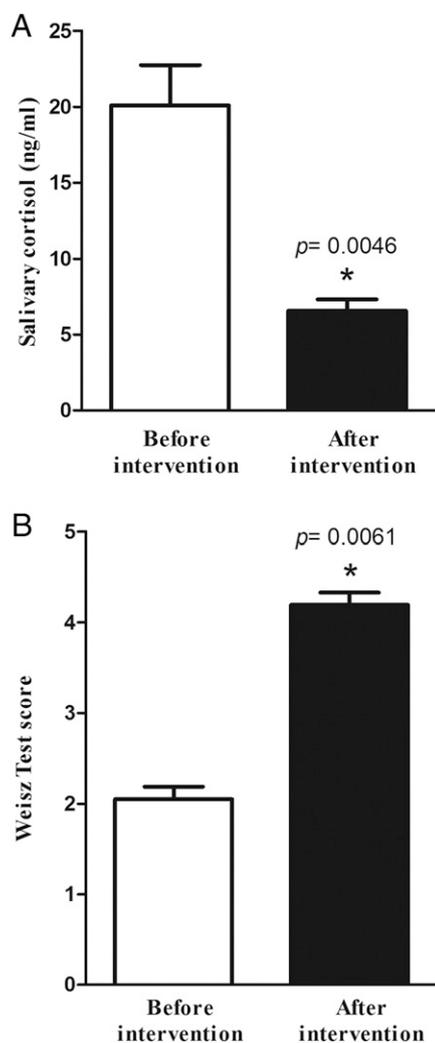


FIGURE 4 A, Comparison of cortisol levels in the patients before and after the intervention ($n = 104$). B, Comparison of the scores in the Weisz test before and after the intervention ($n = 104$). *Significant differences according to the Mann-Whitney U test.

understand. The intervention children had higher scores than the nonintervention children, which reflected a lower level of distress in the second group. Given that other variables were similar in both groups and that they did not have any significant differences with respect to demographic and pathologic characteristics, the observed effect on the subjective level of discomfort or well-being as a consequence of the stress could be attributed to the humor therapy interventions with a high level of certainty.

This test also was applied in the second phase of this study in which the immediate effects of the interventions were evaluated; the results showed that the scores after the interventions were higher than the scores before the interventions, which indicated that humor therapy had a beneficial effect on the subjective sensation of discomfort or well-being experienced by the hospitalized children.

Altogether, these results suggest that an intervention based on humor is a useful therapeutic strategy in decreasing stress levels in pediatric inpatients. The methodology used demonstrates the positive effects of humor therapy on pediatric inpatients through 3 different measures (1 a biological marker) to quantify stress levels.

The evaluation of subjective effects was limited in this study, given that the Weisz test assesses the emotional state only in the moment in which it is applied. The Parker test also presented limitations because it involves different points of view of caretakers, which are, in many ways, a subjective perception of the children's state. The broad age range of participant children may be another limitation because the psychological processes to cope with stressful situations are age-dependent. Additionally, the group of children included in this study may be different from those in other hospitals regarding their diagnoses, and this difference may fuel variable efficacy of humor therapy in those hospitals. It is important to note that humor is culturally conditioned and, thus, humor therapy may need to be adapted to specific cultural contexts. This study did not assess the accumulative effect of interventions or time progression of the effect and this topic needs to be addressed in future studies, particularly because in this study the length of stay in hospital was variable and length of stay can affect stress levels.^{69,70}

These findings support and justify the implementation of humor therapy programs in pediatric units of hospitals. Humor therapy is low cost, does not create adverse effects, and is easy to implement. The

decrease in stress levels may help to achieve a better response to treatment and hospital personnel. Furthermore, the quality of care that hospital humor programs may provide takes into account the child's viewpoint,⁷¹ which may help children cope with procedures and illnesses and may help parents with situational coping as well.^{67,68} The relationship between humor therapy and decreased stress levels reinforces the importance of a more humanized approach in hospitals, which may help improve patient coping and adaptation to disease and hospitalization.

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