



The Power of Play in Pediatric Prognoses

Senior Project

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Kathryn Flax
Chemistry & Physics Department
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Kathryn C Flax
Honors College Scholar

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Date

Natalya Locklear
Faculty Mentor

5/4/20

Date

Joshua Kalin Busman, Ph.D.
Senior Project Coordinator

Date

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Abstract

The hospital environment can be an intimidating and stressful place. For children, who are often not included in their medical decisions, the experience can be even more overwhelming and often leads to a traumatic experience. Hospitals and other healthcare environments attempt to improve the experience by decorating pediatric wards or having electronics available. However, these distractions do not help relieve emotional stress that the children face. The body's response to this stress leads to anxiety, negative behavior, increase in pain, and slowed recovery time. A possible solution to relieve some of this stress is through a tactic of play therapy, or medical play. Research has shown that using play therapy can result in reduced anxiety and stress hormone levels and faster recovery and procedure times. By allowing children to do what they love, playing, healthcare environments may become slightly less intimidating and less children would grow up traumatized by the field of medicine.

The Power of Play in Pediatric Prognoses

Introduction

Every day, thousands of children lay in hospital beds. Whether they are recovering from surgery, receiving treatment after an emergency situation, or getting cancer treatments, many of these children are scared. They are in a new place, surrounded by strangers and they are being poked and prodded, some not knowing why. These situations cause stress which leads to anxiety, prolonged recovery time, and an overall emotionally distressing experience for the child. These experiences can lead to a life where the child grows up being terrified every time he or she has to go to the doctor or enter the hospital. There are many tactics that hospitals and healthcare workers use to attempt to calm the child and reduce stress. They paint the rooms brightly or add characters on the walls. However, a newer and successful technique is the implementation of play therapy. Play therapy has the ability to minimize some of the stressors that take place in the medical settings as well as allows the patient to be more hands-on in treatment and recovery.

Lerwick illustrates an example of an eighteen-month old girl who seemed to be suffering from severe dehydration. Her parents took her to the emergency department several times each eliciting a traumatic experience for the young girl. She needed intravenous fluids, but because of the severe dehydration it was difficult to administer and she had to be held down by multiple strangers. Additionally, to rule out other issues, the doctors needed to obtain a urine sample by completing a catheterization, which again, the child had to be held down for. This happened several times over her multiple trips to the emergency department. The experiences left the child “scared, confused, and seemingly terrorized by strangers (medical providers) and those she trusted (parents)” (Lerwick 2016). This is just one example that Lerwick describes, but the theme of confusion, worry, and trauma are common in every situation. For children, experiences like

these become engrained in their memory. The trauma of the healthcare environment does not dissipate and the child is very likely to grow up and never feel comfortable around medicine.

It is normal for children to have fears and to get scared every once and a while. Many children are scared of the dark, or monsters under the bed, but usually these fears are due to imagination and are not from experiences. The trauma of medical experiences, from receiving vaccinations at a yearly check-up to an emergency situation that may lead to surgery, are very much real and leave a child scarred. However, the fear that a child develops in medical situations can be more harmful than it first appears. According to one source, “up to 20% of the population reports feeling “white coat syndrome” when coming into contact with medical doctors” (Lerwick 2016). White coat syndrome is a physiological condition in which a patient develops anxiety, hypertension and rapid heart rate when entering into a healthcare setting. Additionally, white coat syndrome can be caused by early childhood trauma or a medical experience that was upsetting. One article suggests that the white coat effect is, “mediated by the overactivity of the sympathetic nervous system; and the subjects may evolve toward a worse prognosis” (Pioli 2018).

Physiology of Stress

This idea leads to the discussion of how the body responds to the introduction of stressors and long term stress. Physiologically, stress response begins in the brain, more specifically in an area of the brain called the amygdala. The amygdala sends an alert to the hypothalamus which is often described as the “command center” of the body. In response to the distress signal from the amygdala, the hypothalamus activates the sympathetic nervous system. This involuntary response is responsible for the “fight-or-flight” action your body takes in response to an emergency. These signals then travel down to the adrenal glands which secrete the

hormone epinephrine. In response, pulse rate, blood pressure, and respiration increase. The increase in oxygen makes a person more alert because there is a greater supply of oxygen going to the brain. Additionally, epinephrine leads to an increase in blood sugar and fat to increase energy levels. All of this happens in a matter of seconds, and it is only the first wave. After the

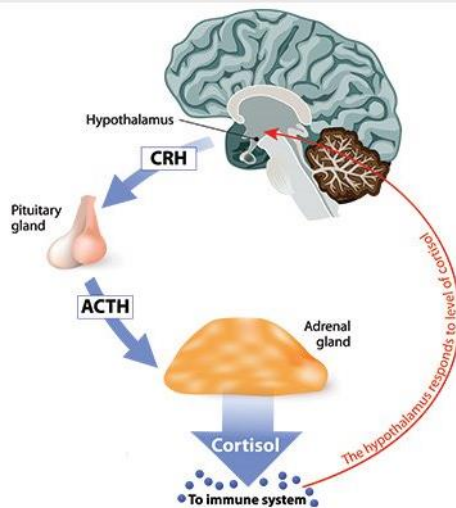


Figure 1 Stress response cycle of HPA axis.
<https://www.everydayhealth.com/cortisol/guide/>

initial response, the hypothalamus then activates the HPA axis which consists of the hypothalamus, pituitary gland, and the adrenal glands. This system is what keeps the sympathetic nervous system going as long as the stressor is still present. Figure 1 illustrates the cycle that takes place during this phase of stress response. The hypothalamus will release

corticotropin-releasing hormone (CRH) which triggers a response in the pituitary gland to release

adrenocorticotropic hormone (ACTH). When this reaches the adrenal glands, they respond by releasing cortisol. This cycle continues until the body feels like it is no longer in danger and can finally relax (Harvard 2011). Unfortunately, in longer stress periods, like when a child is admitted to the hospital and must stay for weeks at a time, his or her body is constantly in a “fight-or-flight” response. This means that this cycle is continuously going. According to Harvard Medical School, “persistent epinephrine surges can damage blood vessels and arteries, increasing blood pressure and [...] elevated cortisol levels create physiological changes that help to replenish the body's energy stores that are depleted during the stress response” (Harvard 2011).

Psychologically, when a child is put into a stressful situation, levels of corticosteroids and serotonin decrease which usually help to control the “fight-or-flight” responses and keep a child happy. (Cohen 2002) When these reactions in the body occur, a child responds with, “dissociative patterns such as a freeze or surrender response. Children may surrender in helplessness, hide from the frightening experience, cling to an attachment figure or object, be unable to communicate their needs clearly, or be overcome with disabling emotion” (Lerwick 2016). The response from the child can be overwhelming for those around him or her. Children may scream or pull away which leads healthcare providers to become more forceful. This becomes a negative cycle because as the provider becomes more forceful, the child gets even more difficult. These cycles of force lead to the traumatic experience and the traumatic stress that occurs with every future interaction in medicine.

From a physical side, the stress that develops for a child in a healthcare setting can also have deteriorating results in healing. Anxiety and stress can lead to a prolonged recovery time. According to Cohen, “stress leads to an increase in cortisol output from the adrenal gland, which results in suppression of the normal immune response and inflammatory reactions” (Cohen 2002). Cortisol is the leading stress hormone released by the adrenal glands and it serves an imperative function in stress response. However, some of cortisol’s effects are only manageable in short doses. It has the ability to raise blood sugar, metabolism, and reduce inflammation which is all important during dangerous situation to increase energy and reduce pain. (Cortisol 2018). However, with prolonged secretion of this hormone, the whole body begins to suffer. For example, in the area of wound healing, cortisol’s ability to control inflammation plays a major role. When the cortisol levels increase, the body becomes confused and the inflammatory ability is no longer able to be controlled. Inflammation is an important aspect of healing because it helps

to identify infection. According to Guo, “GC cortisol functions as an anti-inflammatory agent and modulates the Th1-mediated immune responses that are essential for the initial phase of healing. Thus, psychological stress impairs normal cell-mediated immunity at the wound site, causing a significant delay in the healing process” (Guo 2010). Figure 2 illustrates the multiple ways that stress can impair wound healing. From the increase in cortisol levels, depression,

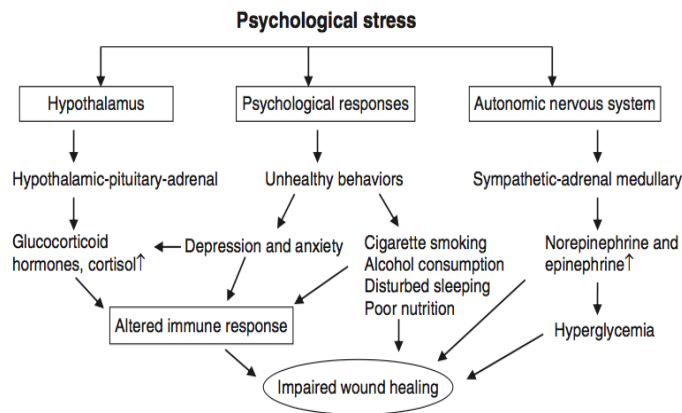


Figure 2. Responses to stress and how they all lead to impaired wound healing. Adapted from “Factors Affecting Wound Healing,” by Guo (2010).

anxiety, and the release of more epinephrine and norepinephrine, the body is in a completely stressed state and the healing process is slowed. For adults, learning how to control the stress that comes with being hospitalized is difficult, but for children, controlling stress is even more challenging. Up to a certain age,

children lack the ability to express their emotions as adults can. As the children express themselves through crying and pulling away, providers have to take the more physical approach which leads to memorable traumatic experiences.

Technique of Play Therapy

Healthcare settings can often be an uncomfortable setting, but if there are ways to offset some of the stress, there may be a decrease in need for restraint of children as well as an overall more pleasant experience for the patient, the patient’s caregivers, and the healthcare providers. Currently, healthcare professionals implement multiple tactics to attempt to calm the child which include, “distraction, creating an inviting physical environment, child and parental preparation and positive staff interactions” (Lerwick 2016). Lerwick goes on to say that although these are

helpful, they do not reach the child’s emotional needs. This is when medical personnel and child psychologists banded together to develop a more hands-on experience that would allow pediatric patients to express their emotions and reduce stress to play. Medical play, a style of play therapy, is a therapeutic technique that integrates, “structured activities designed according to the subject’s age, cognitive development and health-related issues, to promote emotional and physical well-being in hospitalised children” (Wong 2018). This style of therapy can come in many different forms and often varies based on the needs, age, and maturity of the child. Children’s Hospital of Philadelphia breaks play therapy into three categories: diversional play, developmentally supportive play, and therapeutic play. Diversional play is a style that is used for enjoyment, to reduce boredom, and to make the setting a little more normal. This may include playing games, watching a show, or playing with dolls. Developmental play involves activities that support the development of the child such as reading or arts and craft that correspond to their age group. Therapeutic play involves activities that allow a child to express emotion, cope with a

diagnosis, or prepare for a procedure. An example of this involves using a doll or figure to illustrate how a procedure might be done and allowing a child to touch various medical equipment, such as a stethoscope, that may be used. Additionally, this style of play can involve having the child draw, color, or even journal as a way to express emotion (Children’s 2014). Many hospitals that use play therapy implement medical play

Type of Play	Objectives	Activities
Preparation Play	<ul style="list-style-type: none"> • To increase children's understanding of medical procedures • To give children a sense of control over threatening events and help to clarify their misconceptions 	Go through every step of a medical procedure using different instruments, such as tailor-made pretend medical dolls, procedural orientation books, real medical equipment, and miniature medical equipment
Medical Play	<ul style="list-style-type: none"> • To facilitate children's expression of their concerns and feelings related to hospitalization • To familiarize children with the hospital environment and routine medical procedures • To facilitate children's expression of their feelings and emotions related to hospitalization 	<ul style="list-style-type: none"> • Provide various real and/or toy medical equipment (e.g. stethoscope, syringe without needles, bandages, medical cup, gloves, mask, nurse's cap, dressing pack, etc.) during children's hospitalization • Get children involved in different kinds of expressive play activities (e.g. painting, singing, dancing, journaling, sand play, puppets, etc.), and encourage them to share or express their feelings
Distraction Play	<ul style="list-style-type: none"> • To reduce the anxiety of children undergoing medical procedures 	Provide interesting games and toys (e.g. blowing bubbles, pop-up books, puppets, computer games, music, video, sensory toys, relaxation techniques, etc.) to distract children's attention from medical procedures
Developmental Play	<ul style="list-style-type: none"> • To promote optimum psychosocial development and prevent regression among hospitalized children 	Involve children in appropriate play activities (e.g. toys, board games, story books, arts and crafts play, etc.) according to their ages and abilities

Figure 3. Type of Play Therapy, the goals of each type, and examples of activities implemented. *Adapted from “Play interventions to reduce anxiety and negative emotions in hospitalized children,” by Li (2016).*

leading up the procedure and then utilize developmental and diversional play following the procedure as these may help distract the pediatric patients from pain. Figure 3 reviews these types of play and includes examples of each. However, note that Li further divided therapeutic play into “preparation play” and “medical play.”

Several studies have been conducted in the area of play therapy and some will be analyzed to understand the efficacy of play therapy in a medical setting.

William Li conducted a study in which a team tested the theory that children who receive play therapy have lower levels of negative emotions as well as decreased anxiety. To assess this theory, he used the Visual Analogue Scale (VAS) and the Children’s Emotional Manifestation Scale (CEMS). The VAS is a scale composed of facial expressions on a board that the children can point to to express their current level of anxiety. The CEMS assesses the emotions of the pediatric patients using a survey with five categories each with a scale of 1-5. Higher scores indicate higher levels of negative emotional behavior. Li split the patients into 2 groups and each group was divided based on age. One group received various methods of play including diversion tactics of doing artwork as well as medical play in which their procedures were described to them through a puppet show. The other group, the control, received standard care. The results are expressed in Table 1. Between the two age groups, the experimental group

Table 1. Summary of Li’s results. Anxiety and Emotional Manifestation scores are out of a possible 25 points. *Adapted from “Play interventions to reduce anxiety and negative emotions in hospitalized children,” by Li (2016).*

	Mean, SD			
	Experimental		Control	
	Ages 3-7 (n = 103)	Ages 8-12 (n = 79)	Ages 3-7 (n = 51)	Ages 8-12 (n = 71)
Anxiety scores:				
Baseline	6.7, 2.4	22.5, 4.3	6.9, 2.5	23.1, 4.5
Post-interventions	3.9, 1.7	19.3, 3.8	6.3, 2.4	22.7, 4.3
Emotional Manifestation scores	9.4, 1.9	10.8, 2.7	12.6, 3.4	13.7, 3.8

averaged a twenty-eight percent decrease in anxiety levels while the control group only averaged a five percent decrease. The data

indicates that the addition of various play therapies decreased anxiety and the negative emotions

were lower in these patients. Additionally, the data suggests that the style of medical play implemented may have been more beneficial to younger children, ages three to seven. In the experimental group, this age group saw a forty-two percent decrease in anxiety after medical play while the older age group only saw a decrease of fourteen percent. Li also took the time to ask the pediatric patients and their parents how they felt about play being incorporated into the medical situation. According to his article, “most of the children interviewed reported that the hospital play interventions helped to relieve their anxiety because they gained more knowledge about their illness and familiarized themselves with the medical procedures” (Li 2016). He concluded his study by stating that it would seem very practical for healthcare workers to implement a program like this (Li 2016). It would take some stress off of the providers and create a more pleasant experience for all involved.

Another study, by Clarisse Potasz, focused on a more quantitative approach in which levels of cortisol were tracked throughout pediatric patients’ hospital stays. The purpose of this experiment was, “to investigate whether children who played during a hospitalization period would be less stressed and therefore show lower levels of cortisol (LC) compared with those who did not play in the same circumstances. The patients, who were in the hospital for surgery, were split into two groups. The control group received standard hospital care while the experimental group had access to a “toy library” as well as hospital care workers designated as “entertainers.” The children were able to play with anything from the toy box which included games, dolls, plastic medical tools, fake household features such as stove and refrigerator, books, and art supplies. For each patient, a urine collection to test for levels of cortisol (LC) was taken on day one and day five of hospitalization. Potasz collected data based on gender and age. She broke down the results based on the three age ranges and the gender of each patient. The results,

summarized in Table 2, concluded that, especially for age groups 2 and 3, the addition of play time reduced the stress response and resulted in lower LC. For example, for girls in the third age range, the playing group saw a decrease in LC of forty-seven percent while those of the same demographics in the non-playing group saw an increase of LC of 105 percent. Potasz explained that further testing was going to be done on the age range one. She explained that these children were often pulled from their play time to go to a medical procedure and would become emotional because they were being pulled from something they were having fun doing. This in turn

Table 2. Summary of Potasz’s research. LC1 indicated cortisol levels on day 1 of hospitalization and LC2 was taken on day 5. Adapted from “Effect of play activities on hospitalized children’s stress” by Potasz (2012).

	Playing group			Non-playing group		
	n (%)	LC1* (µg/24 h)	LC2* (µg/24 h)	n (%)	LC1* (µg/24 h)	LC2* (µg/24 h)
Boys age range 1	8 (17.54)	107.4±116.4	280.2±691.8	6 (10.52)	202.5±134.2	206±237.9
Boys age range 2	5 (8.77)	125.2±68.47	81.28±42.82	6 (10.52)	109±58.52	196.8±238.5
Boys age range 3	0	–	–	2 (3.5)	387.7±338.8	322.7±417.7
Girls age range 1	8 (14.03)	107.8±86.97	241.7±553	7 (12.28)	133.1±110.5	137.5±113
Girls age range 2	4 (7)	249±85.09	133.4±82.58	4 (7.01)	137.2±66.26	112.3±77.08
Girls age range 3	3 (5.2)	236±62.23	124.7±134.8	2 (3.5)	189.5±244.7	3902±5485

increased their cortisol levels. Potasz concludes the article by stating, “Play is an easy, low-cost activity that can be

used almost everywhere in a hospital. Considering the high costs of health treatments and the low budgets assigned to these treatments [...] this professional can adopt a simple activity like play to establish new protocols to decrease stress during hospital stays and maybe even decrease the length of this stay, helping to reduce health costs” (Potasz 2012). This article established a very precise test to quantitatively detect stress in pediatric patients. Many studies simply use qualitative data such as surveys and observation of behavior to establish data, so using concrete numbers such as cortisol levels offered an inside look as to how a pediatric patient’s body was reacting to being in the hospital.

A final experiment, conducted by Nadia Brown, focused on the rate of healing when diversion tactics of play therapy were incorporated. Brown focused on the use of an electronic tablet called, Ditto, that contained videos, games, and coloring spaces to occupy the time of

pediatric burn patients as they sat through dressing changes. According to Brown's hypothesis, "averting attention away from the pain of wound care procedures and focusing on more pleasantly engaging sensory stimuli dampens transmission to the thalamus, limbic system and cortex, and the full extent and awareness of pain may be reduced" (Brown 2013). For the experiment, Brown collected patients with similar second degree burns. Half of the participants were given the Ditto tablet, while the other half only received standard care. Initial pictures and measurements were taken of the burns and the progress was recorded throughout the healing process. Additionally, nurses and the patients recorded behavior and pain scales during every

Table 3. Summary of Brown's research. Indicative of the the mean (M) number of days that it took for the wound to heal. Additional data was collected and adjusted based on the severity (mean depth vs deepest depth) of burn. *Adapted from "Play and heal" by Brown (2014).*

	Intervention	M (SD)	MD	CI	p-Value
Days to re-epithelialize	Standard	13.51(6.56)	Ref	Ref	Ref
	Ditto™	11.35(3.61)	-2.14	-4.38, 0.10	0.061
Days to re-epithelialize Adjusted for mean depth (mean PU)	Standard	13.51(6.56)	Ref	Ref	Ref
	Ditto™	11.35(3.61)	-2.26	-4.48 to -0.04	0.046
Days to re-epithelialize Adjusted for deepest depth (minimum PU)	Standard	13.51(6.56)	Ref	Ref	Ref
	Ditto™	11.35(3.61)	-2.12	-4.26, 0.03	0.053

M: mean; SD: standard deviation; MD: mean difference; CI: 95% confidence interval; PU: perfusion Units (laser Doppler imager); min: minimum.

progress update. Brown explained that the typical

healing time, or re-

epithelialization, for a

second-degree burn was 14

days. The results of the experiment showed that the use of a distraction play during dressing change resulted in an average recovery time that was two days shorter than the average with standard care (Table 3). Additionally, over the course of the three dressing changes, Brown records that the average pain and anxiety scores, maximum heart rate and time taken to change the dressing were all significantly lower with Ditto.

Conclusion

All three of these research experiments illustrate the role that techniques of medical therapy can play. Li focused on the qualitative aspects of stress, such as anxiety and negative behaviors, to collect data that showed how play therapy of various types decreased overall anxiety and negative behaviors. Potasz proved that the use of toys and play can reduce cortisol

levels which are a direct indication of stress. Finally, Brown made the connection between stress and rate of healing. By implementing the distraction play technique of play therapy, Brown saw a decrease in healing time of two days, the patients were happier, and procedure times were shortened. These are just a few of the many experiments that have indicated that play therapy can help in the reduction of stress and aid in faster healing. The hope is that with the reduction in stress, a child will not be as frightened to enter a medical setting. The trauma of being in a hospital or undergoing a traumatic procedure can leave a child scarred for the rest of his or her life. Additionally, with play therapy's ability to reduce healing time, a child would not have to be down for so long. Children rely so heavily on the access to play that when they are faced with hospitalization, the necessity to lay in a bed for weeks is difficult. The implementation of play therapy, especially in a hospital setting, would create an overall more positive experience for everyone involved. With a calmer, less anxious child, parents' stress is lowered, and healthcare workers can perform procedures without having to traumatize the child. Of course, being in a hospital can be a frightening experience, but making a child feel more comfortable by letting them play and be a kid can make a huge difference.

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