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Biochemistry 4455G: Kids Kicking Cancer

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**A Report on the Effectiveness of the Kids Kicking Cancer Heroes Circle
Program and Suggestions for Future Improvements**

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Background of the Organization

Kids Kicking Cancer (KKC) is a non-profit organization that provides weekly martial arts classes for children facing health challenges, to ease their pain and empower them to heal physically, emotionally, and spiritually. Certified martial arts instructors use the Heroes Circle Program to teach breathing, visualization, and relaxation techniques, in addition to traditional martial arts. The program is completely volunteer-based, allowing for the services provided to be at absolutely no cost to families. Classes are open to children experiencing any type of pain, including physical and emotional pain, as well as their siblings. Children attending the classes have diverse health conditions including (but not limited to) cancer, autism spectrum disorder, generalized anxiety disorder, or developmental delays. The program aims to provide immediate pain reduction and teaches children pain management skills and breathing techniques that they can use in their day-to-day lives, or during medical procedures. The overarching goal of the program is to give children a sense of power, peace, and purpose.

Introduction

Pain is a public health problem that affects the quality of life of patients and their families¹. Although often under-recognized, there are several reasons it must be addressed, particularly in pediatric populations. For pediatric patients, pain is a unique and complex problem because they are also undergoing physical, emotional, and cognitive development². Additionally, pain may cause several impediments to personal and familial experiences throughout their lifetime. Children with chronic pain may experience social and educational setbacks due to absence from school. The unpleasant sensation of pain itself is not the only cause for relinquishments of a 'normal' lifestyle; there are also psychological tolls that worsen the perceived pain. Clinical studies have shown that children with chronic pain are at higher risk of developing depression, anxiety, sleep disturbances, and developmental problems³. As many as 20% of children who undergo surgical procedures receive inadequate relief for this lifelong concern¹.

Currently the main mode of pain relief for childhood cancer patients is regular administration of analgesics, such as opioids. However, the current opioid crisis suggests that this is not a sustainable solution for pain management. It is difficult to objectively assess pain, and therefore inappropriate use of opioids is common and can have consequences including morbidities, disabilities and even death². Additionally, the child's fear and anxiety of anticipated pain can lower their threshold for pain and is related to the conversion of acute pain to chronic pain, which may continue into adulthood⁴. Education and implementation of non-pharmacological approaches to pain relief are crucial for pediatric pain management. Therefore, the mission of Kids Kicking Cancer – to help children relieve pain, short- and long-term, through meditation and martial arts therapies – can be incredibly valuable, if effective.

Although it had not been extensively studied, the efficacy of the methods used by the Kids Kicking Cancer program have been investigated in previous studies for pain management. One study used fMRI and MRI scans to examine how meditation can reduce pain, and it was shown that meditation is able to suppress activity in regions of the brain responsible for the

emotional appraisal of pain, although the physical sensation of the painful stimuli remained the same¹. This study supported the idea that meditation affects one's perception of pain and is therefore an effective pain-reducing technique. Additionally, martial arts techniques have been shown to reduce pain scores in children with malignancies. This may have implications in reducing the use of opioids and increasing compliance to therapy^{1,5}. From teens to toddlers, muscle relaxation, mindful meditation, and breathing techniques accompanied by simple imagery have shown to be effective for relieving pain and increasing quality of life^{1,2,6}. Furthermore, cancer patients who practiced Tai Chi (a martial art with meditative modalities) for 50 minutes per week, over a 12 week period, expressed lower levels of pain and fatigue than patients who were treated with standard care⁵. The emotional benefits of martial arts intervention include improvements of self-esteem, family dynamics, and reduction of anxiety, stress, and depressive symptoms. Additionally, cancer patients who practiced martial arts exhibited stable insulin levels, improvements in strength, flexibility, cognitive function, survival, and inflammatory/metabolic markers, compared with control groups of patients⁵.

Martial arts and meditation also benefit children who have other types of distresses, especially those with no effective pharmacological interventions. Body scans are a form of mindfulness training, in which participants learn to meditate while increasing the awareness of their present thoughts, emotions, and bodily sensations⁷. A previous study demonstrated the correlation between mindfulness and dynamic neural connectivity in youth, which suggested a therapeutic potential of mindfulness-based interventions for children who are vulnerable to stress and adversity⁸. Eight studies have indicated the benefit of mindfulness training in children and adolescents with ADHD⁹. Of these eight studies, one reported that parents observed improvement in their children's inattention, hyperactivity, and impulsivity through mindfulness exercises. Moreover, mindfulness has been shown to reduce the stress and anxiety in patients with Generalized Anxiety Disorder, who developed stronger resilience to stress-inducing tasks⁷. Martial arts also have potential benefits for children facing health challenges. A study demonstrated various exercises (including martial arts) were able to improve the stereotypic behaviours, social-emotional functioning, cognition and attention of children with autism spectrum disorder (ASD)¹⁰. It had also been reported that 14-weeks of karate training decreased stereotypy in children with ASD¹¹. Finally, it is important to appreciate that meditation techniques have no adverse effects and are well-received by children and their families^{5,12}.

Although there is limited statistically-supported evidence due to small sample sizes and lack of control groups, several studies indicated efficacy of these mind-body techniques in reducing physical and emotional distress. The purpose of our study was to investigate whether the therapeutic effects of these techniques reported in the literature held true for the participants of KKC, and to uncover other possible benefits of the program. We used the survey responses as feedback to generate suggestions for improvement within the program.

Survey Results and Discussion – Children

All children's surveys were conducted either during or after karate sessions. For ethical purposes, children were told that participation in the survey was optional, and that they could terminate the survey at any time. We also received consent from each of their parents or guardians. Over the course of 4 sessions, we were able to interview 18 children between the ages of 4 and 13, with the average age of children interviewed being 8.4 years old.

The full set of interview questions posed to the children can be found [here](#). Their respective answers can be found [here](#). Quantitative values for the yes/no questions are summarized in **Table 1**. Common answers to the qualitative questions can be found in **Table 2**.

Analysis of the children's responses showed that the KKC program strongly emphasizes a community-based atmosphere. This was evident when 83% of children stated they had siblings in the program, 100% of children stated that they liked their instructors, and 78% of children claimed that they had made friends through the program. By supporting family relationships, friendships, and instructor-student relationships, KKC appears to be successful in creating a social support network for children with health challenges, and thereby promoting an important component of overall health and wellbeing.

One of the missions of KKC is to give children a sense of purpose. According to the organization and the instructors, this purpose is meant to stem from their ability to use the meditation and martial arts skills they have learned in situations outside the program and teach these skills to others. Our results show that 67% of children report using their skills outside of the program and 61% of children report teaching their skills to others, including their friends, family, classmates, and other KKC participants. We found that children who reported using their skills outside of the program often use them when angry, anxious, before bed, and/or before and throughout medical procedures. Our results indicate that the purpose-driven mission of KKC is being realized, even in children as young as 4 years old. Children are therefore using the skills they are learning even after they have left the gym. This program is effective in teaching children meditation techniques, martial arts, and emotion regulation techniques that they can use long after they have left the program. Future studies could look into following the children on a long-term basis and seeing whether these children continue to use these skills after they have left the program, and whether this has had an impact on their emotional and/or physical pain levels.

The most positive responses we received were that 100% of children surveyed are excited to attend the program every week, and that 100% of children reported that this program has helped them feel better in some way (either by increasing their happiness or perceived strength). These statistics indicate the strength of this program by confirming that all children experience immediate gratification from the sessions, as reflected by their level of excitement to participate, and long-term gratification from the sessions, as reflected by their self-reported feelings of improvement due to their enrollment in the program.

When asked about their favorite part of the program, children responded with a wide variety of aspects, such as kicks, games, water breaks, meeting new friends, assisting the instructors, teaching other children, and learning karate. This reflects the diverse nature of

activities within the program. Not every child benefited from every portion of the program, for example, children with developmental delays found the meditation difficult. However, every child found some aspect that they enjoyed. This may provide reassurance to parents who are hesitant about enrolling their children in the program. Children are able to assess what they need and find an aspect of the program that caters to their specific needs.

The insights gained from asking children about their least favorite part of the program allowed us to propose some improvements that could be made to address issues with the program. Some children mentioned that the sessions seem long, and this is not ideal after they have been at school all day. This may be combated by offering a weekend session. Weekend sessions may also attract more children, as their schedules may be more open to attend during this time. Another critique we received was that the noise level can get quite high, and this was especially problematic for children with sensory processing disorders. The noise level could potentially be controlled if there was an alternative quiet room available for children to utilize if they find the noise levels unbearable in the gym. Additionally, children could be separated into groups with instructors offering different activities to each group based on the skills they wished to practice at the time. Children wanting to release energy through martial arts can work in one space, while the children wanting a quiet space to meditate can be relocated to another room. This may help children seeking lower noise levels to do so while still remaining a part of the program. Lastly, to address the issue of children not wanting to leave, KKC must continue to offer the program and advertise it to the community to benefit as many children and families as possible.

To improve the quality applicability of our results, we propose that this survey continue to be distributed to children in order to gain more data and monitor responses over time. More quantitative data could be obtained if a control group of children who are not in the program were available for surveying. This would allow for a comparison of the short- and long-term pain levels of children in the program with those who are not, through statistical analysis. It must be noted that involvement of a control group would require research ethics board approval. Lastly, a better measure of long-term pain management due to participation in the program may be obtained if children are asked about their pain levels before ever beginning the program, and their responses are monitored throughout the duration of their participation in the program. Our results are intended to be a valuable starting point to secure funding for the program, and to create methodology that will allow for systematic qualitative and quantitative testing of various aspects of the program. However, more comprehensive studies are needed to increase the validity of our data and understand the long-term impact of the program.

Table 1: Quantitative data from children's surveys.

Question	Percentage of children who answered yes
Do you have siblings in the program?	83.3%
Do you like your instructors?	100%
Have you made friends through the program?	77.8%
Do you use the skills you learn outside of the program?	66.7%
Do you teach the skills you learn?	61.1%
Are you excited to come to the program?	100%
Has coming to the program helped you?	100%

Table 2: Qualitative data from children's surveys.

Question	Common answers
Why do you attend the program?	To learn karate, to help siblings feel better, to get active in a safe way, enjoyment, to see friends
What skills have you learned in the program?	Jumps, kicks, punches, blocks, body scans, self-defence, breathe breaks, parachute games
How do you use your skills outside of the program?	Breathe breaks when angry, meditation before bed, breathe breaks to deal with bullying, before/during medical procedures
What is your favorite part of the program?	Kicks, games, water breaks, meeting new friends, assisting the instructors, teaching other kids, learning karate
What is your least favorite part of the program?	Difficulty of moves, length of sessions, seeing other children with cancer, noise level at sessions, leaving for home

Survey Results and Discussion – Parents/Guardians

We interviewed 13 parents/guardians of children attending KKC to identify whether the program was helping to improve the quality of life for their children. The surveys distributed to the parents/guardians can be found [here](#). All raw data from the parents/guardians' responses can be accessed [here](#).

After asking parents about the health challenges that their children face, it was clear that although KKC was initially intended for children with cancer, it also serves children with various other disorders such as sensory processing disorder (SPD), generalized anxiety disorder (GAD), renal disease, cerebral palsy, autism spectrum disorder (ASD), and ADHD. Parents acknowledged that each child experiences KKC differently due to their health challenges. For example, a child with SPD can develop physical movements with a high level of support, and a child with GAD can make new friends and feel comfortable and safe in a new environment. Parents also commented on some areas of improvement. Several parents disliked the noisiness of program, especially those who had children with ASD or GAD, as they become uncomfortable in loud settings. While many children currently manage this by wearing noise-cancelling headphones, it is an issue that could be resolved by separating groups of children during noisy activities, as mentioned in the previous section. These challenges make it difficult for some children to appreciate KKC, but most children still understand why they attend KKC and look forward to attending every week (**Table 3**).

Children attend and enjoy KKC because it is a fun environment in which they learn to manage their health challenges. This is heavily attributed to the Senseis. Many parents reported that their ability to actively engage with the children was their favorite part of the program (**Table 4**). It is especially important that children at KKC feel engaged and welcome, because in other social environments their health challenges may ostracize them. The Senseis ensure that the children are learning to manage the challenges they face through deep breathing techniques. This was evident after we found that 69% of parents reported that KKC helps their children manage physical pain, and 100% reported that it helps their children manage emotional pain. The use of these techniques is not confined to the gym in which the children practice, as 85% of parents reported that their children use skills developed at KKC outside of the program. In most cases, they referred to deep breathing techniques that are used to help a child regain their composure when feeling overwhelmed, anxious, upset, or angry. The results obtained through the parent/guardian surveys seemed fairly consistent with the data obtained from the children's surveys. Both surveys indicate that KKC empowers children by teaching them to manage their emotions and develop self-confidence

The wellbeing of parents often impacts the wellbeing of their children. Therefore, it was important for us to analyze how parents were impacted by the program. 85% of parents reported that they themselves use some of the skills their children have learned from KKC. Some parents practice the deep-breathing skills in the household as a method for all family members to relax when feeling stressed or unwell. Some also use the skills when handling stressful situations in their day-to-day lives. In keeping with good health practices, 77% of parents also mentioned that they receive support from KKC. They have the opportunity to meet other parents who also have children with unique health conditions, and can provide one another with support, advice, or

share resources. However, many parents noted that the current structure of the program does not fully facilitate parent-parent interactions and could be improved. In the future, KKC should emphasize the parental support aspect of the program, perhaps by grouping parents in a quiet seating area so they can more effectively interact with one another. We also suggest that KKC make efforts to plan social events for parents that would allow them to build connections amongst each other and strengthen their support networks. Lastly, KKC could advertise and advocate for the use of community resources by parents, such as mental health counselling or organized support groups. A list of local mental health support program, such as the one compiled by [Southwest Health Line](#), could be advertised to parents in cases where they require additional support for themselves or their children. This would allow KKC to better connect with community services and add to the support parents experience from the program.

Table 3. Quantitative data from parent/guardian surveys.

Statement	Percentage of parents that agree/strongly agree
My child(ren) understands why they attend this program	85%
My child(ren) look forward to attending this program	92%
My child(ren) use the skills learned in this program outside of the program	85%
This program helps my child(ren) when in physical pain	69%
This program helps my child(ren) when in emotional pain	100%
This program has helped my child(ren) work through challenges such as aggression, anxiety, fatigue, depression, etc.	92%
I have learned to use the skills my child(ren) learns in the program (Meditation, martial arts, etc.)	85%
I receive support from this program (Emotional support, sense of community, awareness of resources etc.)	77%

Table 4. Qualitative data from parent/guardian surveys

Question	Common Answers
What skills do your child(ren) use outside of the program?	Deep breathing techniques used when upset, nervous, overwhelmed, anxious, depressed, or acting violent
What skills have you learned from the program?	Deep breathing techniques to relax, handle stress or emotional pain
What has been the most impactful moment you have experienced from the program?	Seeing children engaged in activities with Senseis; Seeing children feel welcome as opposed to feeling ostracized as they often do; Seeing children develop self-confidence; Seeing children managing pain in their lives using skills from KKC
What is your least favourite part of the program?	KKC can be noisy, it is difficult for parents to interact with each other

Survey Results and Discussion – Volunteer Senseis

Volunteers with KKC have all earned black belts in martial arts and are therefore qualified instructors of the meditation and martial arts components of the program. As a sign of respect, each volunteer is referred to by the children as “Sensei”, a Japanese word meaning teacher. Currently, KKC is working with 27 volunteers in London to run their biweekly sessions. Senseis work closely with the children each week and watch them grow both as individuals and martial artists. Therefore, it is critical to account for their perspective when analysing the impact and effectiveness of the program. Responses from 15 of the volunteers were obtained and analysed for the purpose of this report. The surveys sent to the Senseis can be found [here](#). The raw quantitative and qualitative data from these surveys can be found [here](#).

The Senseis became interested in volunteering with KKC for a variety of reasons, including personal recommendations, interest in karate, interest in service opportunities, or giving back to children. Some respondents indicated that their interest in KKC began following a presentation at their dojo. KKC should continue to implement these recruitment methods as the program grows beyond the boundaries of London and the surrounding county.

All volunteer Senseis reported using either martial arts or meditation techniques when coping with their own pain. In fact, 80% of the Senseis reported using *both* meditation and martial arts to cope with pain, demonstrating that Senseis use the techniques they teach for the same purpose that they encourage children to use them. This commonality allows for a greater level of understanding between the Senseis and their students regarding the use and effectiveness of these techniques, specifically for the purpose of pain management. A summary of these quantitative answers, as well as others, can be found in **Table 5**.

From the perspective of the Senseis, the impact of the program on the children and their families is both practical and meaningful. Each week, the children participate in reflective exercises, which provide them with an opportunity to share success and struggles from the previous week. During this time, they often share ways in which skills from the program were helpful in other contexts. This time also allows the Senseis to hear firsthand the impact that the program has on the children's daily lives. In addition, many of the Senseis get to know other members of the family and often learn more about the challenges they face and the impact of the program on each family. Approximately 73% of the Senseis surveyed either agree or strongly agree that children experience pain relief from activities conducted during the session. However, the remaining responses were 20% responding "neutral" and 7% responding "strongly disagree" to the statement. These anomalies are important to consider and may be due to the fact that many children are not in great pain when they come to a session, which would prevent them from experiencing pain relief. This lack of pain at the start of a session may be due to a variety of reasons including their excitement to participate in the activities or the fact that they may not attend a session when they are in pain. Therefore, it is likely that Senseis were not in full agreement with this statement as the activities as conducted at the session may not result in visible pain relief. However, other data collected suggests that these activities can contribute to pain relief in other contexts, including the extensive use of learned skills outside of the program environment. The Senseis have seen the practical impact of their work on the daily lives of the children, as well as the break it provides both children and their families from the challenges they face. Respondents also acknowledged how the program creates a safe space for children to be themselves and restores normalcy to the program. A summary of the Sensei's perspective on the impact of the program can be seen in **Figure 1A**.

It is clear from all the data collected that the volunteers enjoy the program. A large majority of the respondents look forward to sessions each week and every volunteer would recommend this opportunity to another qualified friend. The personal impact the program has on the volunteers includes learning and personal growth opportunities as they get to know the children and their families, expansion of their social network, and an improved mood. **Figure 1B** is a compilation of some quotations from the survey that reflect the personal sentiments expressed by the volunteer Senseis.

The respondents indicated many strengths of the program as well as certain aspects of the program that can be personally challenging. The strengths of the program are reflective of the driving factors that result in the return of volunteers, week after week. These largely center around observing the impact of the program on the children who participate, whether that be through their growth, their smiles or their stories. Additionally, getting to know the children and their families personally is a major strength of the program from the volunteers' perspectives. However, this does not come without challenges. It can be taxing on a Sensei to know details of the struggles that families deal with on a daily basis and this is not always easy information for volunteers to digest. Whilst these personal relationships can lead to rewarding sentiments on the part of the volunteers, it can also make it all the more difficult when health challenges result in life-threatening or even fatal outcomes. It may be beneficial to communicate support resources around the city of London such as helplines, or even set up monthly support groups to provide an environment of support amongst the volunteers to help them through these circumstances. Volunteers have also noted that the passing of a child in the program proved to be a personal

challenge for them. Although challenges to exist and should be acknowledged, many respondents noted that volunteering with the program brightens their day. This is a very positive and important response to have received, as it speaks to the positive impact of the program on the volunteers.

The volunteers identified some areas to be addressed and improved within the program. These are important to consider as the program grows and expands geographically. Often it can be difficult for Senseis when children don't get along, or when there is a "lost child" in their session. The lost child is described as a child who is not engaged throughout the session, or at a particular point in the session. This could be for a variety of reasons including the health challenges they face, or the environment created by a certain activity going on at that time. It can be difficult for Senseis to plan ahead for these situations as attendance is not consistent from week to week. Although a solution is not apparent, this challenge can certainly be addressed to ensure maximum engagement is achieved for each student given their capabilities. Finally, systemic barriers to access for programs including KKC obstruct the ability of the program to grow and benefit those who need it most. Information about the program does not easily or efficiently get to the children and their families in the hospitals who would most benefit from the program. As such, strategies to overcome these barriers and increase exposure through marketing efforts are essential to secure the growth and expansion of the program.

Table 5: Quantitative Sensei survey data.

Statement	Percentage of respondents who agree/strongly agree
Senseis who use meditation techniques to cope with pain	86.7%
Senseis who use martial arts techniques to cope with pain	93.3%
Senseis who use meditation & martial arts techniques to cope with pain	80%
Senseis who look forward to coming to sessions each week	86.7%
Senseis who would recommend the volunteer opportunity to a friend	100%
Children are enthusiastic about attending the program each week	100%
Children express pain relief from activities conducted during the session	73.3%
Children use skills/ techniques learned at KKC, outside the program	93.3%
Children find support amongst each other	93.3%

Impact on Children & Families	Personal Impact
<ul style="list-style-type: none"> • “Kids use the deep breathing to get needles” • “Siblings can become engaged and find their skills for dealing with the stresses” • “Gives parents and students a break for their daily routine” • “Provides connections to other families undergoing similar challenges” • “It gives children a safe place to be themselves” 	<ul style="list-style-type: none"> • “Every single child has taught me something” • “I believe it has made me a better person, parent and martial artist” • “Personal growth, meeting more people in the community, learning new skills” • “...makes my day a little bit better” • “After a KKC class, I leave smiling ... always”

Figure 1A: Quotes depicting Senseis’ perspectives on the impact of KKC on children and their families

Figure 1B: Quotes depicting the personal impact of KKC on Senseis

Conclusion

Our results are consistent with past literature in showing that the Kids Kicking Cancer Heroes Circle program is effective in reducing both physical and emotional pain in children, allowing them to create social support systems, and encouraging them to use the pain management skills they learn outside of the program. Both children and parents enjoy the program and would recommend it to others.

In addition to this report, we have created a factsheet summarizing the mission of the organization as well as the findings from this study. A digital version linked to KKC’s social media sites, website and email address can be found [here](#). A version for print can be found [here](#). Based on our data, we suggest that future studies be done into the long-term effects of the program while including an appropriate control group. In regard to practical changes that can be done within the program to enhance its benefits, we suggest that a separate quiet space be made for children who may find the program overwhelming, and that social events are held for the parents and instructors seeking additional support.

All of us from Biochemistry 4455G truly enjoyed our time working with the children, parents, instructors, and administrators at KKC. We appreciate all efforts carried out by these parties to support our study and make us feel welcome. We give full permission to KKC to use our data in any way they deem appropriate, and we hope our study helps advance the mission of Kids Kicking Cancer.

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