

Use of the Buzzy as a Non - Pharmacological Pain Management Tool among Young Adults with Mild Trypanophobia

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Abstract: *The purpose of this project is to address the need for non - pharmacological pain management resources for young adults, especially during vaccine administration. To help alleviate anxiety and injection pain, our research team employed the use of the “Buzzy” at our university’s vaccine clinics. Simply described, Buzzy is a handheld device about the size of a computer mouse that buzzes (vibrates) on the skin. The buzzing confuses nerves in the area so patients receiving injections, like a vaccine, do not feel sharp pain. During vaccine clinic days, students were asked if they would like to hear more about how using Buzzy could help take the “sting” out of their vaccine. Data showed very positive experiences using the Buzzy, including decreased pain and decrease in anxiety. During this time when being fully vaccinated against COVID - 19 is critical for public health, having a non - pharmacological pain management tool available may help to increase vaccination rates, especially with booster doses.*

Keywords: Buzzy, trypanophobia, youth, vaccine, pain relief

1. Introduction

The purpose of this project is to address the need for non - pharmacological pain management resources for young adults. Oftentimes, literature on non - pharmacological pain management focuses on children, though it is known that young adults, too, experience anxiety and mild to severe trypanophobia (fear of needles) (Olbrecht, et al., 2020; Orenius, et al., 2018.) Having a fear of needles may cause adults and young adults to delay or avoid receiving important vaccines, such as a yearly flu vaccine and the Covid - 19 vaccine and boosters. A recent study by Singh and colleagues (2022) found that of 2568 school - age children, 1125 (47.7%) reported a strong fear of needles, and nearly all students reported a dislike of needles and vaccinations. A meta analysis completed by McLendon and colleagues (2018), included 119 original research articles. They found that the majority of children exhibited needle fear; while prevalence estimates for needle fear ranged from 20 - 50% in adolescents and 20 - 30% in young adults. The Center for Disease Control and Prevention (CDC) and Freeman (2021) also estimates as many as 2 in 3 children and 1 in 4 adults have strong fears around needles. As many as 1 in 10 people might delay the COVID - 19 vaccine due to these fears (Freeman, et al., 2021)

During the height of the Covid - 19 pandemic, it was mandatory for university students to be fully vaccinated against Covid - 19. The university held vaccine clinics where students were able to walk in and receive their vaccination and/or booster. To encourage students to receive their vaccine and to help alleviate anxiety and injection pain, our research team employed the use of the “Buzzy” as a non - pharmacological pain alleviator. Simply described, Buzzy is a handheld device developed by MMJ Labs, Atlanta, GE, USA that is about the size of a computer mouse that buzzes (vibrates) on the skin. Based on Melzack and Wall’s 1965 “Gate Control Theory, ” the purpose of the device is to

create a “buzzing” sensation on the skin, which in turn confuses nerves in the area. This results in patients receiving injections, like a vaccine, to not feel sharp pain. The Buzzy has been used successfully with pediatric patients within a variety of settings (Binay, et al., 2019; Cho, et al., 2019; Khoshghadam, et al., 2021).

Because of Buzzy’s success with pediatric patients, our research team posited that college students would be interested in using the Buzzy to help relieve injection pain and alleviate anxiety associated with a needle stick. The research team developed the study protocol and received university IRB approval. Data was collected across the semester for 12 weeks. During vaccine clinic days, members of the research team asked students if they would like to hear more about how using Buzzy could help take the “sting” out of their vaccine. The students completed a consent form and a brief survey. The Buzzy was applied to the injection site for one minute, and moved one inch above the injection site as the vaccination took place. Students then completed a second survey about their experience. At the end of the study period data was entered into SPSS for analysis where results showed very positive student experiences using the Buzzy. Students were eager to learn about the Buzzy, and use it during their vaccination. The majority of students reported significantly less pain while using the Buzzy compared to previous injections, and reported significantly less anxiety related to the needle stick when Buzzy was used. During this time when being fully vaccinated against Covid - 19 is critical for public health, having a non - pharmacological pain management tool available may help to increase vaccination rates, especially with booster doses.

2. Literature Review

It is well known that most children do not like needle sticks, especially when multiple sticks are administered at the same

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time (i. e. routine vaccinations). Taddio et al., found in their 2012 study that 63% of children ages 6 - 17 reported a fear of needles. Howe and colleagues (2011) found that among children ages 4 - 16 diagnosed with type 1 diabetes, 41% reported fear of needles. They also found that as children progress from infants to preschool age, fear of needles tend to become more intense (75% of that age group reported a fear of needles), as they anticipate the poke. As a result, their muscles may become tense, making intramuscular injections hurt more, children may try to move to avoid the poke, resulting in caregivers of other office staff needing to restrain them, others may sweat, turn flush, cry, and even vomit with the mere thought of receiving a vaccine (Taylor et al., 2021).

Because past experiences heavily influence future experiences, it is important to help young children cope with receiving vaccines and other injections. By the time a child reaches age 18, they typically will have received at least 50 injections (CDC, 2023). Several healthcare professionals have recognized that fear of needles may begin very early in children and as a result developed ideas and techniques to use when immunizing children to try to minimize pain and anxiety (Sørensen, et al., 2020; McLenon, et al., 2018; Taddio et al., 2012; Howe et al., By using different techniques to ease pain and fear, health care professionals aim to make the immunization experience better, resulting in a decrease in anxiety and fear with future injections. These techniques include the use of a numbing cream prior to injection (Olsson et al., 2021; Taddio et al., 1994; Hanson et al., 1993), the use of vapocoolant spray “cool spray,” (Gupta et al., 2017; Shah et al., 2009; Akbas et al., 2023), administration of oral glucose during injection (Stevens et al., 2016; Uzelli et al., 2014), and various forms of distraction. The most popular forms of distraction include guided imagery (Birnie et al., 2018) virtual reality (Arane, et al., 2017), distraction cards (Canbulat et al., 2019), and iPads (Singh et al., 2023; Ali et al., 2020).

Use of the Buzzy during injections has also been studied among children. Buzzy® (MMJ Labs, Atlanta, GE, USA) was developed by pediatrician and a nurse who wanted to provide a non - pharmacological pain intervention for children undergoing a needle stick. They used the “Gate Control Theory” to guide their creation of the Buzzy. The Gate Control Theory suggests that “Nerves from all over the body run to the spinal cord, which is the first main meetingpoint for the nervous system. In the spinal cord, you might imagine a series of gates into which messages about pain arrive from all over the body. These gates can sometimes be much more open than at other times. This is important because it is through these gates that messages from your body pass towards your brain. If the gates are more open, then a lot of pain messages pass through to the brain and you are likely to experience a high level of pain. If the gates are more closed, then fewer messages get through and you are likely to experience less pain. (Melzak, et al., 1965; Moayed et al., 2012).

The purpose of the Buzzy is to interrupt the pain signals and “close” the gates. This should result in feeling no or less pain during injections. The Buzzy is shaped like a bumble bee with a vibrating body along with small wings that can be

frozen. It is thought that the combination of the vibration and cold interrupt the pain signals from the injection site to the brain. The Buzzy is powered by battery and can be turned on and off with a simple switch. The wings are detachable so they may be re - frozen and sanitized between patients. For use, the Buzzy is placed between the “pain and the brain,” by either attaching it to the arm (or leg, chest etc.) or holding it in place manually. Once in place, the vibration is turned on and the device held in place until the injection is complete. Ideally, this is between 30 and 60 seconds. Several studies have supported the benefits of using the Buzzy with pediatric patients. Lescop et al., (2021) utilized the Buzzy with 108 children ages 4 - 17 years (average 9 years) and a lidocaine patch with 107 children. They then compared the children’s pain rating (based on the FACES scale) and found the Buzzy performed nearly as well as the lidocaine patch during injections. In another study, Bergomi et al., (2018), investigated whether the Buzzy or auditory distraction provided more pain relief to 150 children during venipunctures. The researchers found that the combination of auditory distraction and the use of the Buzzy brought the children the most relief from pain and anxiety. Combining several methods with the Buzzy has also shown to be an effective method to reduce pain and anxiety. Erdogan et al., (2021), utilized distraction cards, virtual reality, and the Buzzy while working with children undergoing venipuncture. Among the 108 participants, a significant number reported pain relief and a decrease in anxiety while using the virtual reality system or the Buzzy.

Because of the success of the Buzzy in providing pain relief and decreasing injection anxiety, this study was developed to test the efficacy of the Buzzy with young adults. While there is a lot of research to support high anxiety and needle fear among children, there is less data on the perception of needles among young adults. This may be in part due to the expectation that young adults have acquired their own coping skills related to injections and do not need any additional intervention. However, the literature indicates that while needle fear and anxiety might be lower among young adults, there are many young adults who do experience needle anxiety and delay receiving vitally important vaccinations in order to avoid the physical and emotional discomfort of injections. Camua et al., (2021) investigated the prevalence of needle fear among young adults. Of the 384 young adults surveyed, 41% shared they have a fear of needles and injections. In another study, Alsbrooks et al., (2022), surveyed 2, 098 adults. They found that 63.2% (n = 1, 325) reported experiencing needle phobia. If pain mitigation was offered to adults, perhaps more adults would get their important vaccine, or feel less anxious about receiving vaccines.

3. Method

Participants were recruited during university vaccination clinic days by way of signage and email messages. The university held vaccination clinic days two times per week across at 15 - week semester. Students coming into the clinic were given information about the Buzzy study and asked if they would like to participate. To participate in the study, students completed a written informed consent. The protocol

was approved by the Southeastern Louisiana University Institutional Review Board.

4. Procedures

Fifty - three students participated in the study and received either their first dose of the Covid - 19 vaccine or a booster dose. Researchers used the following verbal script when speaking with participants:

“Hi, my name is _____ and I am a faculty member/student in our child life program. Are you a current student attending Southeastern Louisiana University? (if yes, then proceed, if no then politely welcome them to campus and tell them to have a nice day). We are conducting a research study to learn more about our new pain management tool, Buzzy (shows student the Buzzy). Buzzy uses cold and vibration to help take the sting out of getting a shot. Would you like to use the Buzzy while you receive your shot?

Great! There are two parts of the study: Completing a survey and using the Buzzy. Before we get started, I need for you to read over the consent form and sign it. Please pay attention to the section that describes who the Buzzy should not be used on. If any of those issues applies to you, please let me know. (If yes, then the student may not participate)

Next, we will have you come over to this area (privacy screen) where you may complete the first section of the survey. When you are finished with that, we will put the Buzzy on your upper arm for at least 1 minute prior to your shot.

(During this time, check in procedures for the vaccine will be occurring as well)

Once Buzzy is secured to your arm with this big rubber band, the nurse will give you your vaccine.

Now that your vaccine is finished, please stay seated here for 15 minutes (standard post vaccine protocol). While you wait, please complete part two of the survey.

Note: Please observe participants for any signs of emotional distress (i. e. flat affect, crying). If those signs are present, please offer the participant a handout on the counseling center and its services and offer to walk the participant to the counseling center (downstairs from clinic). ”

5. Results

Participant demographics

A total of 53 students with a mean age of 21 years (SD = 2.24) participated in the study. An overwhelming majority of the students were female (83%, n = 44) and reported their class standing as either junior or senior. Most of the participants in the study reported their race as either African American (38%, n = 20) or White (47%, n = 25). Participants reported a range of majors with the modal major of nursing. The majority of students lived off campus (64%, n = 34) and reported that they did not belong to any student organizations on campus (64%, n = 33). Almost half of the

participants reported that they were receiving their booster vaccine (47%, n = 25), while 34% (n = 18) reported that they were receiving their second vaccine, and 19% (n = 10) reported that they were receiving their first vaccine. Half of the participants reported having had COVID - 19 and 83% (n = 44) reported that a loved one had been diagnosed with COVID - 19. Of the participants, 10 (19%) reported that a loved one had passed away due to COVID - 19. Lastly, an overwhelming majority of participants (91%, n = 48) reported that if they were given the opportunity in the future to use the Buzzy system with injections, they would want to use the system again.

Instruments

A survey was constructed based on the inventory for measuring clinical anxiety by Beck, Epstein, Brown, and Steer (1988). Pre and posttest measures for the study were based on this inventory and open - ended questions were added to the survey to elicit in - depth information about participants' experiences with the Buzzy system.

6. Results

Results of quantitative and qualitative data were gathered during the study. Quantitative data examined the mean difference between pretest scores (prior to the use of the Buzzy system) and posttest scores (with the use of the Buzzy system) by way of a paired samples t - test. It sought to test the hypothesis that there would be a significant mean difference between pre and posttest scores on the anxiety inventory. Qualitative data amassed by way of open - ended questions on the survey were analyzed through a content analysis for major themes.

Quantitative results. Interestingly, a significant mean difference was found between pretest (M = 32.26, SD = 14.18) and posttest (M = 26.79, SD = 9.58) scores $t = 4.57$ (52), $p = .001$. This indicated that participant scores on the anxiety inventory decreased from pre to posttest. In other words, with the use of the Buzzy system, participants felt less anxious about receiving the vaccine. These results supported the hypothesis that participants would feel less anxious about receiving the vaccine with the use of the Buzzy system.

Qualitative results. When asked what about the Buzzy system helped you, three main themes emerged from the data. The three main themes included, “It gave me something else to think about – it distracted me; ” “Helped me relax – made me less nervous; ” and “I didn't feel anything – reduced pain/numbed the area. ” When asked if they were receiving their second dose of the vaccine or their booster – did they feel the Buzzy system reduced their discomfort in comparison to their other COVID vaccinations, three main themes emerged here as well. The three main themes were, “I could barely feel the shot I received today – reduced discomfort/numbed pain; ” “Prefer this method; ” and “It relaxed me. ”

7. Discussion

Data from the study supported prior results suggesting that the use of the Buzzy during injections helped to alleviate

injection pain and decrease needle anxiety. The data also supported the notion that young adults do experience needle fear and anxiety and they, too, could benefit from using the Buzzy during injections. Several participants asked if the Buzzy would be made available at the student health center, especially for flu season. Unfortunately having the Buzzy available outside of the vaccine clinic days was beyond the scope of the project, but student enthusiasm surrounding the use of the Buzzy served as a strong indicator that students might be more compliant in receiving vaccines on schedule if the Buzzy is available to them.

Another important finding is that participants seemed to be more accepting of the intervention when offered to them rather than if they had to seek out help with their fear themselves. Oftentimes young adults may feel they do not need help and they simply need to “just do it” and get the injection over with. They may also feel shame regarding their fear (Lilliecreutz et al., 2010; Love et al., 2021) and delay receiving the injection (Taddio, 2012). This delay can lead to an increase in psychological distress as they continue to ruminate on the impending needle stick (McMurtry et al., 2015, Huff et al., 2022). Awareness of needle fear and anxiety along with the availability of non - pharmacological pain management techniques may help adults and young adults cope more effectively with their injections and perhaps increase vaccine compliance.

8. Future Scope

With the success of the Buzzy with the young adult population during the Covid - 19 vaccine clinics, a next step would be to offer the Buzzy at all times at the student health clinic. With the availability of the Buzzy, students may experience less anxiety related to vaccines or injections, and not delay their vaccines or any other treatments (i. e. blood tests, medications). It would be interesting to utilize other pain management interventions like those mentioned previously (i. e. virtual reality, lidocaine patch, cold spray) with this population. Due to the differences in cognitive and psychosocial development between children and young adults, the most effective method of injection fear alleviation may be different. This information may lead to more effective options when working young adults.

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