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Team Norms 9/10/19 Team Drum

- If you are going to be absent, let the other person know
- If we disagree on something, go to/seek outside sources
- Be accountable
- Be on time
- Don't make big decisions with out the other persons input
- Don't backs on any instraments

9/11/19

Question Everything:

C_1 • what instrament family?
- how do materials effect sound?
- how much hassel is it to fix?

C_2 • what is actually effected by the water?
- how much weight would a solution add?
- What parts are apart of our instrament?
- What sort of price point would we need?
- how durable does it need to be?
- Whats most effective?

C_3 • Is it permanant or not?
- How much water is bad?

C_4 • Just water proof or weather proof?

C_5 • Would we need to do carriers + stands?

1) How do we decide which instrament family to use?
2) How are the different parts affected by water?
3) How do we decide if its permanant or not?
4) How do we decide if its waterproof or weather proof?
5) What parts of an instrament need to be waterproofed and how do we decide?

Nathan Ellis

Continued to page

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Brainstorming 9/11 : Problems

1

vers get wet
nd don't dry
ast.

2

If water gets in screw holes of stands/carriers, the screws can "freeze" and lock in place

Wet drum heads ruin sticks

3

Continued to page 3

Continued from page 2

Heat / Cold can ruin drum tuning

Black drum heads

It's hard to stay in tune when its realy hot or cold

Continued to page

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KWR Charts

9/11/19

Idea One: Drum Covers get wet and don't dry well

What do we know:
- Can't put them in dryer
- they take up space
- they are absorbant

What do we need to figure out:
- how to make them less absorbant
  - what materials
- Making drum covers user friendly
  - stick bags
  - easier to take on and off

What resources do we need:
- ways to test materials
- current drum covers
- alternative materials

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Idea Two: Water can lead to rust and ice that locks skrews in place and damaging wood.

What do we know:
- the above stated happens and damages the drum
- makes it harder to tune and repair the drum
- more likley for someone to break something
- can't adjust anything

What do we need to figure out:
- how to keep out water with out interfering with with playin/tore

What resources do we need:
- a way to safely test without hurting drum
- need a drum
- variety of materials to test ~~of~~ for sound effect

Idea Three: The usage and quality of drumsticks is lessened by water

What we know:
- Sticks can get slick
- bass mallets can be ruined by water

What do we need to figure out:
- a way to protect sticks from water
- a better grip for sticks

Resources:
- sticks, lots, variety
- a way to test

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PROPRIETARY INFORMATION

http://thevault.musicarts.com/everything-you-need-to-know-about-drumsticks/

Arts, M. &. (2018, October 30). Everything You Need to Know About Drumsticks.

"As a drummer, your drumstick is an extension of your mind. Remember the glory days, when you would play symphonies with mom's pots and pans scattered about the kitchen floor, with only a wooden spoon to conduct the notes. You can look back fondly to where it all began, and marvel at far you have come.Now that you've grown up you have honed and perfected your craft. That next masterpiece is just waiting to come alive. All you need is a good pair of drumsticks, and a solid knowledge base about what you can do with those slim wooden sticks. Add just the right touch and your imagination is sparked anew. "

https://go.galegroup.com/ps/i.do?id=GALE%7CA173230498&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=08851158&p=HRCA&sw=w

Zaza, C., Fleiszer, M. S., Maine, F. W., & Mechefske, C. (2000). Beating injury with a different drumstick: a pilot study. *Medical Problems of Performing Artists*, *15*(1), 39-45.

"Many studies indicate that percussionists are among the instrumentalists at higher risk for playing-related musculoskeletal disorders. Several drummers with musculoskeletal disorders have reported an alleviation of symptoms and a return to pain-free playing with the use of a newly developed oriented polymer drumstick. These anecdotal reports have prompted the authors to investigate the properties of the oriented drumsticks compared with wooden drumsticks. This paper reviews the musculoskeletal problems of percussionists as well as the risk factors for work-related musculoskeletal disorders, and presents the results of preliminary tests comparing the properties of the oriented polymer drumsticks with those of wooden drumsticks. Electronic devices for measuring vibration amplitude were attached to the drumsticks, which were mounted with a clamp on one end. The drumsticks were tapped gently and the response was recorded. There was a noticeable difference in amplitude between the two types of drumsticks: the oriented polymer drumsticks stopped vibrating sooner than the wooden drumsticks. Risk factors for work-related musculoskeletal disorders include high repetition, high force, and other factors, such as vibration. With regard to carpal tunnel syndrome risk, the vibration properties of oriented polymer drumsticks are potentially favorable compared with wooden drumsticks. The authors' next step is to determine whether the oriented polymer drumsticks are associated with a reduction of risk for playing-related musculoskeletal disorders in drummers."

https://www.jstage.jst.go.jp/article/ast/32/5/32_5_168/_pdf

Dahl, S. (2011). Striking movements: A survey of motion analysis of percussionists. *Acoustical science and technology*, *32*(5), 168-173.

"Like all music performance, percussion playing requires high control over timing and sound properties. Specific to percussionists, however, is the need to adjust the movement to

Continued from page 7

different instruments with varying physical properties and tactile feedback to the player. Furthermore, the well defined note onsets and short interaction times between player and instrument do not allow for much adjustment once a stroke is initiated. The paper surveys research that shows a close relationship between movement and sound production, and how playing conditions such as tempo and the rebound after impact affect the movements. Furthermore, I discuss differences in movement organization, and visual information from striking movements."

http://www.paulbuyer.com/article/Dline%20Exp%201.pdf

Buyer, P. A. U. L. (2006). The Drumline Experience: How Much it Too Much?. *PERCUSSIVE NOTES*, *44*(5), 42.

"What exactly is it about playing in a drumline that attracts so much interest? Certainly, some students thrive on competition and the challenge of achieving perfection, while others are drawn to the technical demands of the music and the thrill of performing in front of thousands of fans. Additional factors include the enjoyment of playing the instruments themselves, the visual and aesthetic aspects of the activity, and the opportunity to perform drum features and cadences. It is also very motivating and meaningful to be part of something bigger than yourself, collectively achieve a common goal, and develop lifelong friendships."

http://musicnuke.com/the-best-tape-for-your-drumsticks/

Spencer. (2017, January 2). Finding The Best Tape for Your Drumsticks.

"All the interaction in a drumming set happens through your drumstick, and therefore feeling at ease with the stick is important. Drumsticks slowly wear and tear. Maintenance requires a lot of care during practice and performance. This trickles down to having a good grip and balancing of rim shots to your pad. Taping might be the long-awaited solution for a lasting drumstick. However, the tape could add some extra weight to the stick forcing you to adjust grip or to not like the idea in the first place. Here, we look at a few pointers on how to overcome these challenges, helping us (drummers) get away with stunning drumsticks."

Problem Statement Shorten the problem statement, not as much explanation time numbers

~~Drumsticks are something that every drumline uses. Since~~ the band relies on the drumline it is important that the players are always in control of their sticks. This becomes difficult when drumsticks are exposed to moisture making them harder to grip and control. ~~The effect of moisture on the playing ability of sticks differs from model to model and the amount of moisture. A change is needed to lessen the effect of moisture on the playing ability of the drumline.~~

Katherine Ellis

Continued to page

Continued from page Patents 10/1

Patents

https://patentimages.storage.googleapis.com/a2/b6/83/be8281e39a0a26/US7968782.pdf
Mackie, K. (2011). *U.S. Patent No. 7,968,782*. Washington, DC: U.S. Patent and Trademark Office

A flexible one-piece self-gripping self-forming-loop attachment, comprising a single ergonomically shaped and dimensioned strip of elastic material with circular apertures at opposing ends for attachment to a drumstick by inserting one end of the drumstick through each aperture in turn giving rise to a loop which is slid along the drumstick to the desired playing position at which a finger is inserted. When the loop is fitted the material surrounding the apertures stretches and causes their shape to change according to the profile of the drumstick.

Pros: The simple design is easy to reproduce and use.
The edvice can be used on more than one drumstick.

Cons: The device does not seem durable or easy to adjust while playing.

https://patents.google.com/patent/US8987569B2/en
Huber, J. (2015). *U.S. Patent No. 8,987,569*. Washington, DC: U.S. Patent and Trademark Office.

A tip-weighted drumstick with a cushioned sleeve that absorbs shock and protects a drummer's hands and other joints while playing. The cushioned sleeve covers a reduced-diameter portion of the drumstick and can be customized with various surface textures, shapes, and other features. The reduced-diameter portion may result in the center of gravity of the drumstick shifting towards the striking end of the drumstick to improve the efficiency and effectiveness of the drumstick.

Pros: Weight on the tip makes playing easier.
The cushioned sleeve allows for customization.

Cons: The sleeve may not help water resistance, and could get slippery itself.

https://patentimages.storage.googleapis.com/e2/07/65/b501107db0cccc/US3365108.pdf
Giba, J. E. (1968). U.S. Patent No. 3,365,108. Washington, DC: U.S. Patent and Trademark Office.

Disclosed in the following specification is a device which maintains a drumstick in a drummer's hand in the proper playing position. A ring which is worn on a finger of the drummer's hand is connected to the drum stick by a short, flexible, and freely swivelling connection whose length is such that when the drumstick is held in the proper playing position there is not interference with the use of the drumstick and when the drummer releases his finger grip on the drumstick, the same remains within reach of his fingers.

Pros: The design is easy to repair and is simple to use.

Cons: People have different sized fingers so it would only be able to be used by one person.

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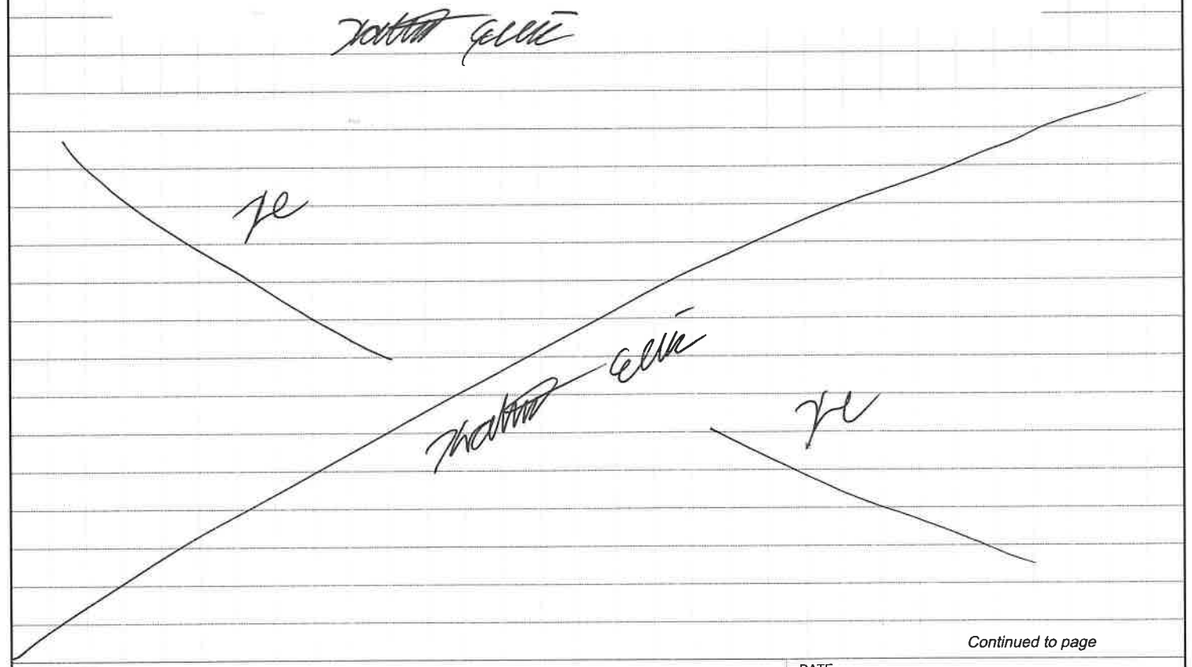
https://patentimages.storage.googleapis.com/40/c1/19/bb4b2deeeded3f/US6310278.pdf
Butler, T. (2001). *U.S. Patent No. 6,310,278*. Washington, DC: U.S. Patent and Trademark Office.

An improved drumstick or percussion striking device wherein the device consists of an elongated member having a striking tip at one end a handle butt at the end remote from the tip and a protrusion or bump intermediate the tip and butt, thus spaced axially from each but more proximate to the tip than to the butt, thereby enabling the percussionist to strike the same object with both tip and protrusion or two objects one with tip and one with protrusion. The elongated member may be a unit or two individual parts solidly interconnected, one called the shaft portion and one called the handle portion. The tip and protrusion may be a part of the member or may be separate and frictionally engaged therewith. An axially disposed oval hand grip on the handle portion and structure for adding weights either to the joint between the two portions or at the butt end of the handle to weight the stick to the percussionists desire. The tip and bump produce as used by the percussionist a variety of sought after sounds.

Pros: Larger diameter handle could help keep the user keep control over the stick
Multiple beads (or parts where the stick hits things) could add sound variety

Cons: The larger handle is still made of wood, meaning the risk of slippery sticks is still an issue.



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PROPRIETARY INFORMATION

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Brainstorming: Concepts/Solutions 10/2/19

A way to texture ~~the~~ a grip into a drum-stick

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X

A wrap (not tape) that is water resistant

ape, not
wrap stuff

raised
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X

Drilled holes, filled with another material for a textured grip

in the
stick

filled

X X

3D stickers that apply to a round drum stick

glue
re
ubber

X X

Paint that dries textured.

think popcorn ceiling but durable and smaller

the
tick
provide
surface

c
t
ly

X X X

rubber rings you can add to the stick to create your own grip.

msticks

O O

well textured finger less glove

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PROPRIETARY INFORMATION

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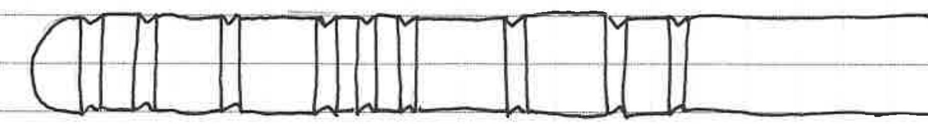
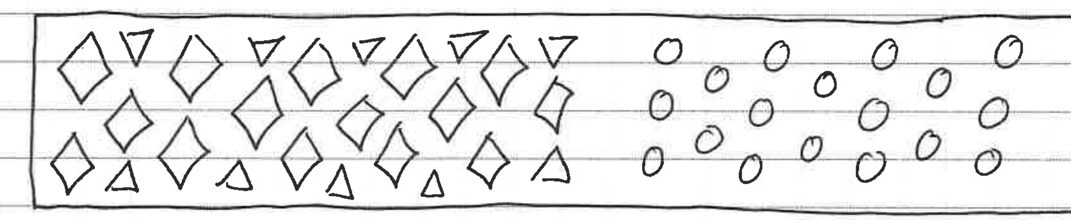
Concept Sketches 10/10/19

11

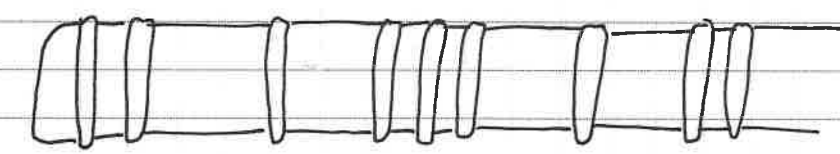
1) Cutting ~~ridges~~ groves into the handle of the drumstick, either by laser engraver or by filing.



2) Textured stick tape, by means of cut outs and/or raised dots.



3) Rubber rings for the drum stick, create your own pattern



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Continued from page Design Specifications 10/21/19

Design Specifications

. Who is the target consumer? Musicians who have need of drumsticks, specifically those in a marching band or DCI setting

. As a team prioritize your list of criteria from most important to least important.

a. **Customer Needs**. What does the customer want/need?
   i. A product that makes drumsticks easier to hold, especially in the rain, that can be used on more than one type of drum stick.

b. **Size and Weigh**t. What size should the product be, or what restrictions to size exist? What are the weight restrictions on the product?
   i. The product must not weigh more than the average warap of stick tape, as to not offset the balance of the drumstick.

c. **Operating Environment.** Identify the environmental conditions relevant to the manufacture and use of the product (temperature, corrosion potential, dust or dirt, pressure, humidity, vibration, noise, degree of abuse, etc.).
   i. Used in most normal temperatures
   ii. No corrosion potential
   iii. Not a lot of dust or dirt
   iv. Normal pressure
   v. Humidity depends on location
   vi. Lots of vibration and noise
   vii. Degree of abuse depends on music style

d. **Performance.** What must the product be able to do? Be specific.
   i. The product must be easy to apply, last more than one use and create a surface that is easier to grip.

e. **Service Life.** What is the required service life of the product?
   i. However long the stick lasts

f. **Product Life**. What is the anticipated length of time that the product will be produced before it is replaced by a newer version or alternate product?
   i. Depends on the service life of the drumstick it is attached to.

g. **Durability and Maintenance**. Will the product require routine maintenance during its service life? If yes, answer the following.
   i. Yes (If using tape)
   - What specific parts of the product must have easy access for maintenance?
     - The surface area of the stick
   - What is the anticipated maintenance schedule?
     - When the stick/tape becomes damaged
   - Are special tools required? How will they be acquired?
     - No special tools needed
   - Will replacement parts be required? How will they be acquired?
     - Replacement tape will be needed, which can be found at stores that carry rolls of it.

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h. **Target Cost.** What is the anticipated cost to the consumer for this product?
   i. Between $5 and $10

i. **Ergonomics**. Identify considerations for the ergonomics of the product.
   i. If not flush with stick surface or embedded in the stick, needs to be very minimalistic in weight and thickness.

j. **Global Environment**. Will the product include any toxic or dangerous substances? What is the plan for disposal of the product at the end of its useful life?
   i. Non-toxic and easily disposable through trash service.

k. **Aesthetics**. Are there preferences in the appearance features of the product (color, surface treatment, shape, material)? If so, describe them.
   i. It would be ideal if the product came in more colors other than black and white. The product must be waterproof, easy to grip in wet conditions, and made from a durable material.

l. **Materials**. Is there a specific material or materials that must be used? If yes, describe it.
   i. The material used must be durable and lightweight.

m. **Safety and Legal Issues**. Identify potential safety and legal issues that may arise from the use of this product.
   i. If product fails and injures someone there might be cause for a legal suit on the victims behalf.

n.

3. Criteria
   a. The design must be finished by the end of the semester
   b. The budget for the design must not exceed $50
   c. The final design must fit in the players hand with the drumstick
   d. The final design must be able to be used in conjunction with a drumstick.

4. Attempt to obtain validation of each criterion and constraint by multiple qualified representatives from each of the following groups: end-users, stakeholders, and field experts.
   a. End-users : players that use drum sticks
   b. Stakeholders :
   c. Field Experts : Players in upper level performance settings

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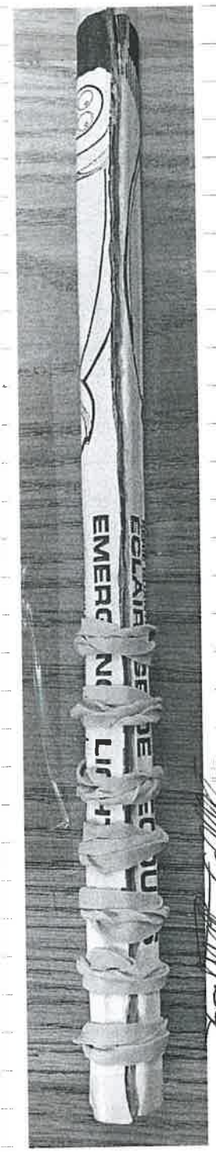

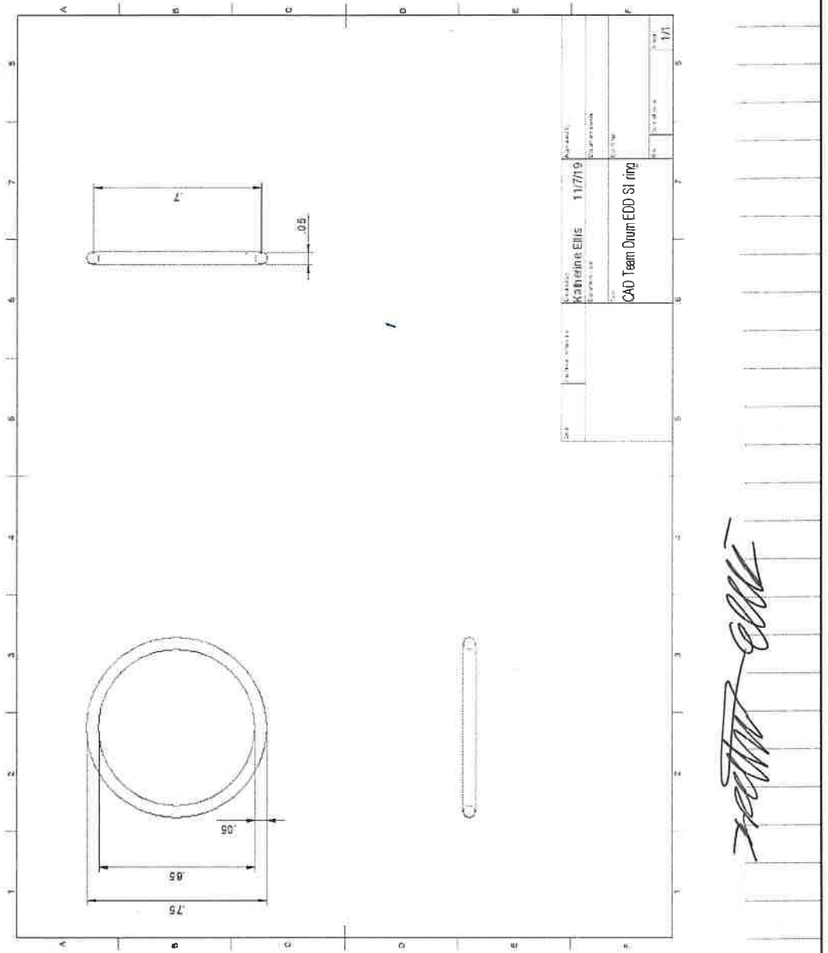

We made our mock up with card board and rubber bands. Then we made a CAD model of the mock up.

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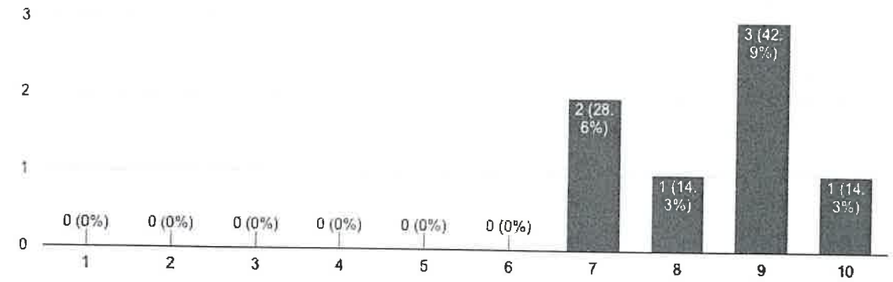
How much experience do you have with using drumsticks?

7 responses



Is dropping sticks because of sweat or water a problem?

7 responses

Do you believe that something like this would solve the problem of dropping sticks?

7 responses

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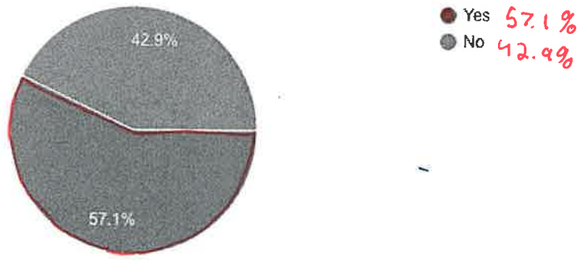
Would you potentially purchase a product such as this?

7 responses



Yes 57.1%
No 42.9%

Do you have any suggestions to help us improve our product?

7 responses

No

Maybe not super aggressive ridges

Changing shape also changes sound quality of the drum stick. Make sure the sound doesn't sound any different as it would without the grip

Make it look like a stick

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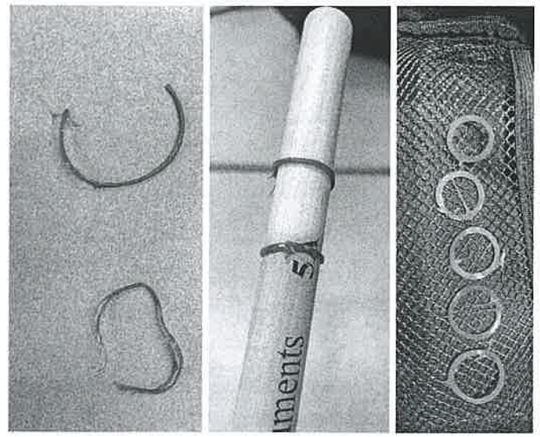
Building and Testing Prototype

To build our prototype we used 3D printing with Ninjaflex material.



Testing Criteria

The product must not weigh more than the average wrap of stick tape, as to not offset the balance of the drumstick:

- Weight of tape:8in = 1g
- Weight of Prototype: 4 rings = 1g
- So the prototype is lighter than the average amount of Stick tape used, about (measure)

The product must be easy to apply, last more than one use:

- Meets above criteria

Easily Produced:

- It took 7 minutes to 3D print 5 rings.

If not flush with stick surface or embedded in the stick, needs to be very minimalistic in weight and thickness:

- The bands are .05 in thick and weight less than 1 gram, this allows them to minimalist,

It would be ideal if the product came in more colors other than black and white:

- They could come in more colors

The product must be waterproof, easy to grip in wet conditions:

- Product is made from plastic, a waterproof material

The material used must be durable :

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Continued from page 17 Building and Testing Prototype Cont. 1/14/2020

- Force needed to break ninja material in .8 ring:
  - Stretched by hand first: 42.86 N or 9.64 lb
  - Not stretched: 44.58 N or 10.02 lb

The final design must fit in the players hand with the drumstick:

- Yes

Must not affect sound of stick:

- Does not affect sound

Must make stick easier to hold when wet:

- Yes ideally using between 4-6 bands per stick

Are they flexible:

- The Ninjaflex material is both flexible and allows for a little stretch.

Comments/Other:

- fits over stick tape
- To increase comfort they should be smoothed out, this would be a process in production
- Because the material stretches the bands fit tightly in place
- Middle sizes work best for marching snare sticks
- Smaller sizes fit on concert sticks
- It might be good to have different sizes in different colors, for organization

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