A Usability Study on: A Toss Juggling Website for Physical Education Teachers

Alexis Zoder
University of Hawai‘i at Mānoa
Honolulu, Hawai‘i
United States of America
azoder@hawaii.edu
http://jugglingpeaz.weebly.com/

Abstract: Many teachers are unaware of the benefits of toss juggling. Research studies show an increase in gray matter of the brain as a result of initially learning how to juggle (Driemeyer, Boyke, Gaser, Büchel, & May, 2008). A website was created for Physical Education (PE) teachers in an effort to teach juggling and inform educators of its benefits. A usability study was conducted to improve the overall design and content of a toss juggling website for PE teachers. The purpose of this usability study was to evaluate the ease-of-use, learnability, and user satisfaction of a toss juggling website for 6th-10th grade PE teachers to implement into their classes. The face-to-face usability testing was screen and audio recorded using Voila Capture. Online resources and tools such as Weebly, Google Forms, Google Drawing, and YouTube were used to design and develop the website. The ADDIE Model guided the creation and progression of my website. This study involves a total of six participants who are teachers over the age of 18. Data was collected through a pre and post survey for all participants in order to obtain quantitative and qualitative feedback. A usability protocol script was used to ask the participants tasks and scenarios pertaining to the website in order to make improvements after Rounds 1 and 2 of testing. Revisions made include: removal of the drop down navigation menu; renaming of some of the navigation menu headings; enlargement of font size of headings and text; addition of a homepage video and juggling equipment links; and reorganization of specific content.

Introduction

There are many positive reasons to start juggling. Firstly, brain research studies support learning to juggle. Secondly, juggling is portable and can be performed in any open space. Thirdly, students can express their creative side when juggling. Toss juggling is a non-traditional sport, and therefore would be an exciting individual and collaborative activity to introduce to students. Due to a lack of toss juggling resources for instructional purposes a toss juggling website was created. An instructional toss juggling website will provide PE teachers with the information and guidance they would need to implement the unique sport into their classes. The site’s main features include: research on the benefits of toss juggling, descriptions of various juggling props (objects), practical toss juggling skills, lesson activities, instructional juggling videos, and demonstrational juggling videos. The purpose of this usability study was to evaluate the ease-of-use, learnability,
and user satisfaction of a toss juggling website developed for 6th through 10th grade PE teachers at a private school on Oahu. This study will directly benefit teachers and students but the usability study was only conducted on teachers. The results of the study led to necessary improvements to the website, so teachers can better navigate the website for individual learning and instructional purposes.

**Literature Review**

There are many benefits to toss juggling and most people are unaware of the benefits; therefore, a website for this complex skill would be essential. Some major benefits include: improvement in coordination, an increase in intelligence, sharpens focus and concentration, increases range of motion in the arms and shoulders, and relieves stress (JuggleFit LLC, 2013). According to Driemeyer, Boyke, Gaser, Büchel, and May (2008), “the ability to initially learn the three-ball cascade juggling task is correlated with an increase in gray matter, whereas further improvement of the skill over time due to training does not seem to alter brain structure” (p. 4). Toss juggling is uncommon in PE class therefore juggling activities would be unique to incorporate into PE for individual challenge or as collaborative group activities. According to the University of Oxford (2009), “We have demonstrated that there are changes in the white matter of the brain – the bundles of nerve fibres that connect different parts of the brain – as a result of learning an entirely new skill,” explains Dr Johansen-Berg (para. 6). According to BBC News (2009), another resource explains “that a 5% increase in white matter was shown in the rear section of the brain called the intraparietal sulcus.” These studies explain how learning a new skill such as juggling can increase and change gray and white matter which provide a valid reason to create a juggling website.

This website will be directed toward teachers and are based on research from David Kolb’s Experiential Learning Theory (ELT) as well as how mindfulness techniques enhance experiential learning (Yeganeh & Kolb, 2009). This learning theory involves placing emphasis on one’s own learning. The learners’ progress through the four modes of the experiential learning cycle: Experiencing, Reflecting, Thinking, and Acting (Peterson, DeCato, & Kolb, 2015). According to Peterson, DeCato, and Kolb (2015), people tend to focus on one or two areas and not engage in all parts of the cycle equally. It is also important for teachers to be mindful and open to different ways of learning rather than get engrossed in common practice routines. “Mindfulness becomes important when we consider how we choose to process and learn from events at work. Learning style determines the way we process the possibilities of each new emerging experience which in term determines the range of choices and decisions we see” (Yeganeh & Kolb, 2009, p. 15). If teachers are aware of the benefits of juggling and the research studies correlated to an increase in gray and white matter from juggling, teachers may be more willing to implement toss juggling into their classes. This website was developed to strengthen teacher confidence in teaching this complex skill, foster individual learning, and enhance peer collaboration among students.

**Project Development**
My usability project began with a paper prototype sketch and a wireframe of the website content pages to get an idea of the design and organizational layout of content (see Appendices C and D). Next, I familiarized myself with using Weebly by using different design features and adding content such as headings, text, images, buttons with links, and videos. I followed my wireframe to create a basic functional prototype website design (see Appendix E). The functional prototype website can be accessed at http://jugglingpeaz.weebly.com/. The functional prototype went through many changes since the paper prototype and was continually improved upon throughout the Fall 2015 and Spring 2016 semesters.

The tools used in the development process are Weebly for my website, Google Drawing to create my wireframe and instructional juggling visuals, as well as Google Forms to create my pre and post survey instruments. All three tools were simple to use and have an aesthetically pleasing look. Another tool I used is YouTube, so I could easily upload original videos created as well as other resources to my website. I chose Google Drawing because of its simplicity and the many shapes to use so I could create neat and colorful visuals in the juggling skills section. Google Forms has a separate spreadsheet with survey responses from participants which look organized and can easily be transferred to another document when collecting and analyzing data. I also used juggling resources to compile instructions on how to perform specific skills which include a few examples such as the cascade, circle juggling, and columns. When I designed my website I made sure to follow the suggested design conventions for web pages such as: make the purpose of each page clear at a glance, keep link names clear and simple, make navigation persistent, and keep a consistent look between pages with repeating fonts, colors, shapes, and structure (Hagen & Golombisky, 2013).

When I developed my project I used the ADDIE model to guide me through the process of Analyze, Design, Develop, Implement, and Evaluate. This model shows the iterative and self-correcting nature of the instructional design process. Therefore, the ADDIE model shows it’s necessary to move back and forth between the elements of analysis, design, and evaluate, so revisions can occur between these elements from the beginning to the end of the instructional design process (Reiser & Dempsey, 2012, p. 10).

Methods

My research question is “how did the interface design affect the user’s ability to easily navigate on the website to find specific juggling information?” The objective was to evaluate the design features and content so that improvements could be made to the site. The goal was to make the website useful for teachers of specific middle and high school grade levels. For this usability study, I recruited three participants for both rounds of testing for a total of six Physical Education teachers from a private school- two females and four males that teach within grades six through ten. I recruited by sending out six separate emails to all individuals asking to participate in a voluntary study. I attached the consent form so participants were aware of their rights and I also provided time commitment information for the face-to-face usability test and for the independent online
surveys. I asked the participants verbally to not discuss the website and surveys with other known participants until the project is complete. I asked recruitment individuals to sign and return the consent form if they agreed to participate.

Pre and post surveys were administered with both rounds of usability testing (see Appendices A and B). A pre-survey was given to all participants before the face-to-face usability test as well as a post-survey after the hands-on interaction with the website. A post survey was given to gain additional insights and comments from participants in order to continue to make future revisions. The same procedures occurred for both rounds but with recent changes made to the website between iterations to see if improvements occurred. The usability protocol was a script created that was read to participants, which asked them to perform tasks and scenarios while thinking out loud (Krug, 2010). This measured website interaction, therefore tested the functionality of the website. Scenarios, prompts, and general questions can be seen in Table 1. These tasks and scenarios were aligned with my purpose and research question in order to gain valuable feedback from the protocol. A pre-test checklist was also created based on Steve Krug’s pre-test checklist to make sure all equipment was functioning properly in order to have sufficient time to fix any problems before beginning the usability test (Krug, 2010). As a researcher, I hoped to see improvements in the post survey from the pre survey in the areas of confidence in juggling and confidence in teaching juggling. I also hoped to see if the website would have an effect on teacher toss juggling implementation in their classes. Screen recording software was used during both iterations to refer back to when collecting and analyzing data.

After the testing was implemented, data collection and analysis began. Google Sheets was used to display data collected from the pre and post surveys. The program Excel was used to compile data from the pre and post surveys into graphs. First, information from the pre and post surveys on Google Forms was gathered and represented in tables and graphs to show data results. At the conclusion of data analysis changes were made to the site. Revisions were prioritized based on frequency and significance of the problem. Questions from the pre and post surveys were designed in the form of multiple choice, rating scale, and paragraph style open-ended responses. The multiple choice questions were used mostly to obtain demographic information and technology use. The paragraph style open-ended questions were used to obtain more elaborate responses for more in depth insights and focused on user satisfaction. The rating scale questions were used for design and content feedback, ease-of-use, learnability, as well as user satisfaction. Rating scale questions were designed so that questions with a higher number (5) will represent a positive response and questions with a lower number (1) will represent a negative response.

<table>
<thead>
<tr>
<th>Question #</th>
<th>Scenarios</th>
<th>General Questions and Prompts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Usability Protocol Scenarios
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>You are a beginner/novice juggler, where would you navigate to first to learn the basics of toss juggling?</td>
<td>Do you find the content on this website interesting and does it motivate you to learn juggling or implement it into your classes. Please explain.</td>
</tr>
<tr>
<td>2</td>
<td>You are inexperienced with juggling and not sure what toss juggling is about and the kinds of objects used where would you go to find this information?</td>
<td>What other information do you think is useful/valuable from the website? Can you explain why it would be useful?</td>
</tr>
<tr>
<td>3</td>
<td>You are a middle school teacher with little experience with teaching juggling but would like to try juggling yourself. Where on the website would you go to find this?</td>
<td>Which page did you find most helpful or effective in learning about juggling? Who do you think would benefit the most from this website?</td>
</tr>
<tr>
<td>4</td>
<td>Your school is emphasizing collaboration in all subjects areas. You decided that with the project adventure unit you would incorporate juggling and try out peer collaboration in your classes. Where would you go to find peer collaboration information to use in your classes?</td>
<td>Would this website be useful if you were looking to learn how to juggle and teach student juggling in grades 6th-10th?</td>
</tr>
<tr>
<td>5</td>
<td>You have a student that is juggling beyond the intermediate level due to previous experience and is making his way to the more advanced skills. Based off the information provided on the website, where could you find additional tasks that are more challenging? What are some specific skills he could learn that are suitable for his level?</td>
<td>What else would you like to see on the website? Does it look organized? Is it easy to location information? What do you think of the design layout and other features of the website?</td>
</tr>
<tr>
<td>6</td>
<td>You have a question about juggling equipment. Where would you go and what could you do to get help or start a conversation?</td>
<td>What is your overall impression of the website layout?</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Are you able to move from one screen of the website to another quickly in order to find certain information? Explain.</td>
</tr>
</tbody>
</table>

**Results**

In the pre survey participants were asked some basic demographics questions such as what grade level(s) do they teach, what is your gender, and select your age group. They were also asked about how confident they are with using technology; what technology device they use most frequently for work; how many hours in a week do they use technology, and what do they use technology the most for. Other questions pertaining to toss juggling include juggling experience, implementation into classes, and confidence in juggling and teaching it.

Participants ages include: two participants within the age group of 40-49, two participants within the age group of 50-59, one participant within the age group 30-39 and one
participant within the age group 60 or over. All participants except one use a notebook (laptop) as their most frequently used technology device at work, the other response was a tablet (iPad). According to the pre survey all participants felt confident and gave a response of (4) with using technology on a 1-5 scale (1) being very unconfident and (5) being very confident. According to the pre survey all participants have toss juggled before. All participants use technology for work related tasks such as research or creating forms. Other reasons include communicating through email, text, or phone, browsing, sports news, watching YouTube videos, and listening to music.

The results from the pre survey showed all participants had toss juggled before but when asked how much juggling experience do you have, three out of six participants (50%) chose none, one participant chose six months to one year, one participant chose one to three years, and one participant chose ten or more years (see Figure 1).

When asked to rate their confidence in juggling on a scale from 1-5, (1) representing “very unconfident” and (5) representing “very confident,” (33.3%) of participants chose (1) “very unconfident,” (50%) of participants chose (3) and (16.7%) of participants chose (4). Therefore, no responses were “very confident” and 33.3% of responses were very unconfident (see Figure 2).

![Figure 1. Juggling experience](image-url)
When asked to rate their confidence in teaching juggling on a scale from 1-5, (1) representing “very unconfident” and (5) representing “very confident,” 33.3% of participants chose (1) “very unconfident,” (16.7%) of participants chose (2), (16.7%) chose (3), and (33.3%) chose (4), while no participants chose (5) “very confident” (see Figure 3).

In the pre survey when asked have you ever implemented juggling into a PE class, 33.3% of participants chose “Yes” and 66.7% chose “No” so based on the “Yes” responses one chose between one month to six months ago and the other chose more than two years ago. Some reasons for never or rarely implementing juggling into PE class include a
response of “never thought to because it just seems fun to break the monotony of a class.” Another participant stated “not being proficient therefore wouldn’t be confident in teaching and demonstrating.” One participant stated “haven’t found uses for it over time; and that it is a fun activity for the students to do for a day or two; it helps me convey the idea of hand-eye coordination as a skill related fitness component.” Another participant “never got around to it.” One participant used it more as a “fun activity or “can you do this activity” with younger students or using it briefly as a hand-eye coordination lesson.”

In the pre survey when asked if you were provided a website about juggling would you then consider implementing it into a lesson or unit, (50%) of responses were “Yes” and (50%) of responses were “Maybe” (see Figure 4). According to the post survey after participating in this study all participants would use this website for a juggling lesson and/or unit.

![Pie chart showing 50% Yes and 50% Maybe responses](image)

**Figure 4.** Consideration of juggling implementation into a lesson/unit

Post survey results show only one response was a “Yes” to now implement juggling lesson activities into your classes and five responses were “Maybe.” I thought by having a useful and exciting juggling resource site for PE teachers that they would be more likely to incorporate juggling activities into classes. Based on comments from the post survey it seems that juggling will be used as a “backup activity” rather than a main activity in the curriculum. A participant comment includes “as a break between units, I might not be able to keep their attention for long periods of time, trial and error may be a factor in the length of time.” Another comment includes “I could teach juggling in classes that allow for more variation in the curriculum, I could see implementation of juggling as a lifetime fitness activity to help develop fine motor skills, or as a fill in activity when space is limited due to rain or other unforeseen circumstances.”
The post survey also shows that five participants approximately (83.3%) feel more confident to teach juggling based on the website content (see Figure 5). One participant responded with “Not Yet” and that “more time is needed with the videos and lessons before feeling confident about teaching it.”

![Post Survey](image)

**Figure 5.** Confidence to teach juggling based on website content

In the post survey when participants were asked if they would recommend the website to anyone, all responded with a “Yes.” Based on feedback one participant recommended this website to middle school teachers and stated that “high school students might not be as engaged as middle school students and that elementary and middle school students would enjoy and benefit the most from juggling activities.” One participant would “recommend the website to other PE teachers for class implementation and possibly other students as a resource to learn how to juggle.” Other comments include “a lot of information in one place; thoughtful layout and thorough content; I would recommend this site to other PE professionals so they have a juggling resource readily available; juggling is something that could help the child and teacher; and juggling is an old activity but renewed by studies that may help students in other subject areas.”

Based on the post survey website navigation, design, and content questions on a rating scale from 1-5 with (1) representing a negative response and (5) a positive response. All but one participant gave a rating of (4) and/or (5) for this section of questions involving ease of navigating to locate content, difficulty performing tasks and scenarios to find specific information, quality of content (practical and ideal for classes), helpfulness of images and videos, satisfaction of the visual appearance of the overall site (neat and aesthetically pleasing), and satisfaction with the design layout of information (headings, text, buttons, links). Only one participant gave a rating of (2) for helpfulness of images.
and videos, and also gave a rating of (3) for all other rating scale questions in the post survey.

A few problems participants encountered during usability testing include difficulty returning to the Weebly site after a link was clicked and a new tab was opened. I was surprised with this problem because all participants in the pre-survey felt confident and gave a rating of (4) on a scale from 1-5, (1) being “very unconfident” to (5) being “very confident” in using a technology device. Secondly, one participant had difficulty finding lesson activities and videos because of the drop down menu. This was essential to change because the lesson activities and videos were included in the drop down menu under the skills tab. Thirdly, I had a slight technical problem during one testing session possibly due to the Internet which included a lag in a video. It took a little longer than it should have for a demonstration video to play.

Some suggestions from participants to improve the website include: “matching the videos with the skills (on the same page) would make it easier so I wouldn’t have to scroll back and forth between two or three tabs; some sort of example form or ideas that would cover assessment of juggling skills as students develop; and the videos should have their own tab as I almost didn’t see them in the drop down menu.” Some comments from participants include: “I thought the website was clean, aesthetically pleasing, and I liked the photos used for each title page on each tab because it used the juggling props to spell out the titles of each tab/page. I found that to be clever and as a user of the website that really appealed to me.” “When seeing the first video of juggling on the homepage I became excited about juggling and remembered how fun it is to juggle.”

The specific components I was interested in improving were design and content which included: making skills and lesson activities easily understandable and usable for teachers; providing helpful instructional visuals and juggling videos; and making the site highly navigable. Improvements made to the site after Round 1 of my usability testing include: the removal of the drop down navigation menu therefore lesson activities and videos have their own tab. I included the addition of a homepage video to capture the viewer’s attention; juggling equipment links to provide resources to purchase equipment; and changed the title of the “Props” tab to “Equipment.” Changes made after Round 2 included the development of the blog page which included the addition of four video juggling routines as examples. Other changes included the addition of advanced instructional juggling videos which are located on the videos page; reorganization of content; enlargement of font size headings and text on the lesson activities page; and changed the title of the “Skills” tab to “How To.” All research and equipment resource button links now open in the current tab not in a new one. Some improvements made to the site that occurred after Round 1 and Round 2 of usability testing can be seen in Appendix F.

Implications or Discussion
Based on the results 83.3% of participants now feel more confident to teach juggling based on the website content. The study also shows that 83.3% are unsure whether they will implement juggling lesson activities into their classes. As a researcher, it is unclear why there were three responses of no juggling experience but all participants responded with a “Yes” to having toss juggled before. This shows that it’s possible the participants tried juggling but didn’t consider having experience so they chose none for experience. As the researcher, it might have been better to ask the question as how many times have you attempted juggling yourself. I realized I should have included this in the pre survey as well as how many times have you attempted to teach juggling in your classes. From this study I think there are other factors that may have contributed to participant responses of only one “Yes” to implement juggling lesson activities into classes after viewing the website. It seems that teachers may need to make time to practice skills more to be able to implement it into classes. Based on a comment, “in some classes there are specific skills with a limited time to introduce, learn, and practice skills in certain classes therefore juggling could be used in classes with more variation.” Based on data collected there may be the need to further research why juggling is not implemented much into classes. There could be reasons such as not enough movement; want to have longer units of traditional sports rather than shorter units with activities such as juggling; lack of juggling equipment, personal uninterest, and doubts about students getting distracted fast from juggling.

The first concern I have based on this study is: why are teachers not taking the time to incorporate juggling into classes? It could be ability but if it is not, then why are they not taking the time to? The second concern: is there a lack of juggling equipment at some schools and is that the reason for preventing teacher implementation of juggling. The third concern is based on post-survey data, five out of six participants used a notebook (laptop) as their most frequently used technology device for work and only one participant chose a tablet (iPad). This shows that if a mobile application was created that it is unlikely and uncertain that the juggling site would be used more to access information. A question that could have been asked in the pre survey is: what technology device to you use most frequently on your personal time? It is possible teachers might use other devices at home to practice juggling, do research, or create lesson plans. I could also have asked would you be likely to use a mobile application of this website rather than go directly to the website. This would provide more data on whether a mobile application would be necessary for this project topic.

Future modifications to this website include suggestions from the face-to-face usability testing as well as the pre and post survey. The first modifications would include making the videos more instructional (step by step) rather than just demonstrating. The second modification includes moving all instructional videos to the skills “How To” page. Three out of six participants mentioned having the videos next to or below the written instructions and diagrams so participants don’t have to navigate back and forth between tabs/pages. The third modification would be to create an assessment checklist, even though at this time it is only for teacher use. It might be helpful for teachers to have an
example of a student assessment checklist of skills and descriptions of throwing and catching movements.

Conclusion

As the researcher, by creating a toss juggling website for teachers, I hoped to see this study as a useful and unique resource for teachers that will assist teachers by giving them the opportunity to strengthen their juggling skills, gain lesson activity ideas, and foster information sharing with colleagues in professional development settings. This website is a useful compilation of information that can be used to spark students attention and allow for peer collaboration when implemented into a class. This project can be explored more and expanded upon to eventually become a website for students to use and possibly be made into a mobile application accessible on electronic devices.
References


Appendix A
Pre Survey

Toss Juggling Pre Survey

Please complete this survey to the best of your ability. Please choose one answer for the multiple choice and rating scale questions. Any questions without an asterisk may not apply or are optional.

* Required

What grade level(s) do you teach? *

[Text input]

Gender *

- Male
- Female

Please select your age group *

- 29 or under
- 30-39
- 40-49
- 50-59
- 60 or over

What technology device do you use most frequently for work? *

- Desktop
- Notebook (laptop)
- Tablet (iPad)
- Smartphone
- Other
Rate how confident you are with using technology such as a desktop, notebook, tablet, or mobile phone? *

1 2 3 4 5

Very Unconfident  0 0 0 0  Very Confident

How many hours in a week do you use technology? *

☐ 1-5
☐ 6-10
☐ 11-15
☐ 16-20
☐ 21 or more

What do you use technology most for (browsing, researching, work-related tasks, communicating via email or text, or social networking)? *

Please list a maximum of your top three reasons, it can be others not listed

Have you ever toss juggled before (objects can’t hit the ground)? *

☐ Yes
☐ No
☐ Not sure
How much juggling experience do you have? *

- None
- Less than 6 months
- 6 months to 1 year
- 1-3 years
- 4-6 years
- 7-9 years
- 10 or more years

Have you ever implemented juggling into a PE class? *

- Yes
- No

If you chose "Yes" for the previous question please state how long ago.

- Less than one month ago
- One month to six months ago
- Between six months to one year ago
- Between one to two years ago
- More than two years ago

If you have never or rarely implemented juggling into PE class, can you please explain why?
Appendix B
Post Survey

Toss Juggling Post Survey
Please complete this survey to the best of your ability.
* Required

What two parts of this website made it most helpful for you to learn juggling skills? *

What two parts of this website were the most helpful to you for teaching? *
Do you now feel more confident to teach juggling based on the website content? *
Please explain

Will you now implement juggling lesson activities into your classes? *
Write Yes, No, or Maybe then please explain

Rate how easy it was for you to navigate to locate content throughout the website? *
1 2 3 4 5
Very Difficult □ □ □ □ Very Easy

Rate the difficulty of performing tasks and scenarios to find specific information? *
1 2 3 4 5
Very Difficult □ □ □ □ Very Easy

Rate this website in terms of quality of content (information is practical and ideal for classes)? *
1 2 3 4 5
Strongly Disagree □ □ □ □ Strongly Agree

Rate this website in terms of helpfulness of images and videos? *
1 2 3 4 5
Not Helpful □ □ □ □ Very Helpful

How satisfied are you with the visual appearance of the overall website (neat and aesthetically pleasing design)? *
1 2 3 4 5
Very Unsatisfied □ □ □ □ Very Satisfied

How satisfied are you with the design layout of information (headings, text, buttons, links)? *
1 2 3 4 5
Very Unsatisfied □ □ □ □ Very Satisfied
After participating in this study, would you use this website for a juggling unit/lesson? *

After participating in this study, would you recommend this website to anyone? Why? *

What else would you like to suggest to improve this website? *

Any comments? *

Submit

Never submit passwords through Google Forms.
Appendix C
Paper Prototype
Appendix E
Functional Prototype Website

Juggling Tips

Content

Toss Juggling for PE Teachers

This toss juggling site provides PE teachers with activities to implement into their classes as well as novice, intermediate, and advanced instructional steps, tips, videos, and juggling benefits.
The top 3 benefits to juggling

1. Increases Gray and White Matter in the Brain
   Studies show that due to initially learning to juggle the 3-ball cascade is correlated with an increase in gray matter, whereas further improvement of the skill over time due to training does not seem to alter brain structure. Studies show that the aging brain is able to retain its neuroplasticity in that brain power can be enhanced with new experiences or tasks. Therefore, the brain is able to form new neural connections: pathways and synapses. These finds may have a significant impact on coming up with new treatments for neurological diseases such as multiple sclerosis where neural pathways become degraded.

2. Sharpens Focus and Concentration
   Juggling engages your problem-solving skills. It helps you focus and direct attention better for different tasks and in many aspects of your life. Juggling has both mental and physical benefits.

3. Improves Coordination
   Juggling is beneficial to all age groups and body types. Juggling has positive affects on all ability levels from the non-athletes to athletes and from people of elementary age to over senior citizen age. It may be easier for some athletes to perform the juggling skills but these individuals can even take their coordination to higher levels by learning new patterns and moves.

What does research say?

“The brain is like a muscle, we need to exercise it,” Dr. Arne May

Beside the many benefits of juggling. According to Oxford University, research shows learning a new complex skill such as juggling can increase gray and white matter in the brain after a certain period of training. Studies also show that once training has stopped after a few months these areas in the brain do not sustain the increased size. Use it or lose it. MRI scans have shown that a 5% increase in white matter can occur when learning the 3 ball cascade when training for six weeks. This white matter change is linked to the time spent learning a new skill not the level accomplished. For more detailed information click on the buttons below.
Jugglers refer to the objects they juggle as props. There are many different kinds of props. Props can come in different sizes, shapes, colors, and materials. The most common are balls, rings, and clubs. I have also seen scarves gain popularity in schools for students at the elementary and middle school levels. Beanbags are also great for novice level jugglers. The square shaped beanbags are the first props I started with as a child and are still my favorite to this day. I will include videos on most props that will be most beneficial to teaching juggling. The bottom of the page includes links to three different juggling equipment websites so you can purchase your props.

**Scarf**
- These scarves are lightweight and are made of woven nylon
- Due to their lightweight and float I suggest this as the first prop to learning the fundamentals
- This is easiest prop to toss and catch with listed on this site due to its slow fall
- I suggest using the ‘16’ x ‘16’ scarves but they come in other sizes such as 24’ x 24’

**Beanbags**
- They are great for beginners in learning the fundamentals as well as excellent for learning to juggle three or more
- Some are made from a polyurethane coated fabric for durability and others are sewn and tightly packed with birdseed
- They are moderate in weight- not too heavy but not too light
- They are an ideal weight for juggling and will not bounce or roll

Start with the recommended props in the following order: scarves, beanbags, juggling balls or tennis balls, rings, and lastly clubs. Complete all the steps 1-4 before moving onto the next prop. This section’s instructions are directed toward using beanbags, and juggling balls or tennis balls. The instructions are the same for the other props but the grip on the props is slightly different. Scarves you hold with your fingers rather than cradling in your hand.
Beginner Skills

The numbered instructional steps below do not match with the diagram numbers. Read the instructional steps first then view the images.

Step 1: The Drop

1. Take all three props toss them into the air and let them all hit the ground with no effort to catch them. This is the called THE DROP.
2. Practice the drop a few times to familiarize yourself because this will likely occur often as a beginner juggler.

Step 2: The Toss

1. Cradle a ball in the center of your dominant hand.
2. Stand relaxed with elbows near your body and hands about waist height.
3. Throw "scoop toss" ball one up at about eye level in an easy arc from one hand to the other and about as wide as your body.
4. Repeat this back and forth continuously in one motion.

Tip: Keep tosses consistent and use a natural "scooping motion."

Step 3: The Exchange - Two Props

1. Pick up a second ball.
2. You should have one ball in each hand.
3. Stand relaxed with elbows near your body and hands about waist height.
4. Throw "scoop toss" one ball up in an arc toward the other hand at about eye level and just as it starts to drop down into your other hand, "scoop toss" the second ball - exchange the two in one motion.
5. Catch ball #1 then catch ball #2.

Tip: All tosses go up NOT across.
Step 4: The Three Ball Cascade

1. Hold two balls in your right hand and one in your left (for a right-handed juggler, do the opposite if you are left-handed).
2. Toss the ball in the right hand that is closer to your fingers up in an arc to toward your left hand.
3. Right after you toss the first ball then toss the ball in your left hand (second ball) in the same arc toward your right hand.
4. Right after you toss the second ball then toss the third ball in your right hand in the same arc toward your left hand.
5. You should be able to continuously without pauses throw and catch in a figure eight pattern.

Tips: As you throw the ball from one hand to the other, you want to scoop from the outside to the inside. Each time you throw the ball it should peak overhead at the center of your body.

Lesson Activities

The tasks below consist of exercises and complete patterns to teach 6th through 10th grade students juggling. I suggest having students start with individual basic tasks then individual challenges then partner tasks and challenges. The goal would be for students to gain confidence and have fun while still obtaining the benefits and feeling challenged. Due to a variety of skill levels you may find the need to work with students having more difficulty and challenge the more proficient students with advanced skills/tricks. The main way to improve is through practice.
The Three Ball Cascade

Try With:
- Scarves
- Beanbags
- Juggling Balls
- Rings
- Clubs

Individual Challenges

I highly recommend having students try these patterns in this order, if students become frustrated with a pattern, have them try using different props first before moving onto a different pattern.

Beginner Skills/Tricks

- Reverse Cascade
- Two in One Hand Columns
- Two in One Hand Shower
- The Shower
- The Claw

Partner Tasks and Challenges

Warm-Up Exercise #1

1. While you’re holding a beanbag in each hand, have your friend toss you a third- into your left hand
2. Before it lands, do an exchange and begin your own juggling
3. After a few moments juggling on your own, throw her one back- from your right hand- and stop

Warm-Up Exercise #2

1. Start by holding three beanbags and giving your friend a fourth
2. Begin juggling and continuing and then on "three" make the toss over to your friend who- at the same time- should feed your hand with a nice easy toss
3. Your friend won’t be juggling during this exercise, her job is strictly to catch your one toss while feeding you another
4. If it’s done smoothly, you can juggle along without skipping a beat

Partner Passing

You will need a partner, an open space, and at least two props.

1. Start with two of the same props with about a 12 feet distance from your partner, facing each other
2. Partner A and B both should have one beanbag
3. Partner A juggles one beanbag from hand to hand then after 6 repetitions Partner B will toss the beanbag to the open hand of Partner A
4. Partner A juggles for 6 repetitions performing the exchange with two beanbags
5. Try to perform this continuously and smoothly without hesitation
6. Switch tosser and juggler roles
7. Try with other props if this is too easy

Variation

1. Both partners stand side by side and start with one beanbag in their hands and the inside hand behind your back
2. Your partner tosses one beanbag up and over to the target (your hand)
3. You wait until her toss has peaked out, then you toss your beanbag back and catch hers
4. Your throw should go just inside her incoming beanbag
5. Try with other props if this is too easy
6. If this becomes too easy, add a third beanbag and instead of doing one exchange and stopping, you will do many exchanges from side to side

Is this too easy?
Problems & Solutions

Are you having difficulty keeping your throws under control?

Try this
1. Practice in front of a wall so you can't throw too far out in front of you
2. Try it sitting down
3. Imagine there is a wire loop attached to the dropping ball, after each exchange ask yourself "did my throw go through the loop?" If not ask yourself how far off you were, then concentrate on the placement of the second toss
4. Mark your hands with targets using a non-permanent marker on your palm where the ball should land
5. If you get frustrated take a short break

Project Idea

Have students create an iMovie (or program they are familiar with) to demonstrate their juggling skills, it could be a partner or individual assignment. Students will create a routine of juggling skills/tricks and put them together to show the skills they learned. They can even add music.

One, Two, and Three Scarves

One, Two, and Three Beanbags
Two and Three Juggling Rings

Reverse Cascade With Juggling Balls

Two in One Hand Columns

Contact Page

Alexis Zoder
azoder@hawaii.edu
University of Hawaii Master's Student - LTEC Program
Bachelor of Science in Physical Education K-12
Appendix F
Website Changes Made After Round 1 and Round 2

- Changed “Skills” tab to “How To”
- Removal of Drop Down Menu

Toss Juggling for PE Teachers
This toss juggling site provides PE teachers with activities to implement into their classes as well as novice, intermediate, and advanced instructional steps, tips, videos, and juggling benefits.
Toss Juggling for PE Teachers

This toss juggling site provides PE teachers with activities to implement into their classes as well as novice, intermediate, and advanced instructional steps, tips, videos, and juggling benefits.

Welcome

Watch this stunning juggling performance using a variety of different props.

A little about toss juggling

Toss juggling involves the manipulation of one or many objects by using one or many hands and trying to keep them off the ground. Juggling is a repetition of controlled throwing and catching and involves much focus and concentration. The person performing the juggling is called the juggler. The juggler refers to the objects as props.
Clubs
- Clubs come in many different materials such as polyethylene (plastic), foam, wood, and rubber
- Clubs also have different shapes due to their diverse styles
- They are more difficult to throw and catch compared to scarves, beanbags, balls, and rings due to shape, weight, and spin
- Start out using foam clubs especially in classes for safety and instructional purposes

Flower Sticks
- Less common but very fun
- I was first introduced to flower sticks when I coordinated Children and Youth Day for the Hawaii Association for Health, Physical Education, Recreation & Dance
- Two shorter sticks are used to toss up one larger stick to perform maneuvers or tricks

Juggling Routines
3/11/2016  0 COMMENTS

I thought it would be a good idea to include some advanced examples of juggling routines with jugglers of different ages to inspire people of all ages to learn juggling.

Juggling Routine 1
This video is outstanding! I think this video will be engaging for students at the middle school and high school level.

Author
Alexis Zoder
University of Hawaii
Master's Student
LITEC
B.S. Physical Education K-12
SUNY Cortland

Archives
March 2016

Categories
All

RSS Feed
Juggling Routine 4

This video is unbelievable! I thought it was great because Steve juggles for elementary aged students.

Instructional Videos

Here is a place to find additional skills. Do not be fooled by the title “Learn 12 of the simplest 3-ball juggling tricks,” these tricks are not easy. Niels Duinker explains some problems and solutions and details of juggling certain skills in slow motion and at normal speed. He breaks skills down into instructional steps to make learning easier. Here are some additional resources from a world-class juggler who shows some other skills I did not include such as "The Box," "The W," "The Giraffe," "Over The Top & Tennis," "Juggler's Tennis," and "Three Balls Mills Mess."
Demonstration Videos

One, Two, and Three Scarves