SciGirls Activity 9
Double Dutch

Icebreaker
Experiment with a twirling rope!

SciGirls Skill: Predicting

You'll need:

- a long piece of rope, say, 16 feet (about 5 meters)
- a large open space with a flat floor or surface
- a stopwatch
- a notebook

Guide your girls as they

1) Stand 12 feet apart, with the rope held between two girls.
2) Begin to twirl the rope in a full circle, somewhat quickly at first, then gradually slowing to the slowest tempo that can keep the twirl going.
3) Have a third girl operate the stopwatch. When the rope is at its slowest tempo, have the twirlers count the twirls for 1 minute, according to the timekeeper. Record the number of twirls per minute at this slow tempo.
4) Predict whether the slowest tempo will be faster or slower when the twirlers move closer together.
5) Bring the twirlers closer together, to 10 feet. Again, find the tempo of the slowest possible twirl. Reminder: the twirlers always hold the rope at its farthest end.
6) Repeat with the twirlers at 8 feet and 6 feet apart.

SciGirls Suggestion: You can introduce the terms *frequency* and *period* in this activity. Frequency is the number of twirls per minute, while period is the amount of time for one complete twirl. A typical frequency might be 50 twirls, and the corresponding period would be 1/50th of a minute.

Find out more about sports investigations at pbskidsgo.org/dragonflytv/show/mattermotion.html

Investigation
Double Dutch

We're Francesca, Precious, and Marnicka, and we jump for joy whenever anyone mentions Double Dutch. One of the most important things in Double Dutch is to sense the ropes' beat. Although you can both hear and see the ropes, it's easy to get distracted by the music, lights, or other kids at a competition. This got us thinking: Does hearing a rhythm different from the ropes' rhythm affect our performance?

For each group of three girls, you'll need:

- 2 ropes for jumping Double Dutch
- a large open space with flat floor or surface
- an mp3 player with ear buds
- rhythmic mp3 files, some at a slow tempo, some at a fast tempo
- optional: a strobe light (CAUTION: Make sure none of the girls has strobe sensitivity.)

Find out more about Francesca, Precious, and Marnicka's investigation at pbskidsgo.org/dragonflytv/show/doubledutch.html

Check out this investigation on the SciGirls DVD. Select "Double Dutch" from the main menu.

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SciGirls Want to Know

What's more important—seeing the rope or hearing it?

Guide your girls as they

1) Plan a Double Dutch jump routine. It could consist of one move over and over or could be a combination of moves.
2) Select the girls who are the twirlers. Have the jumper set the rope tempo the way she likes and begin jumping according to the planned routine. Count the number of maneuvers completed before the jumper trips. If the jumper completes 20 moves without interruption, stop and record the number 20.
3) Rest briefly, then the jumper repeats the routine two more times, counting the number of moves each time.
4) Rest, then give the jumper the mp3 player. Select a song with a driving rhythm slower than the tempo of the ropes when they're twirling. The jumper listens to the mp3 file, with the volume only high enough to just drown out any slap of the ropes on the ground. Jump the same routine while listening to the mp3 file, recording the number of jumps completed without a miss. Repeat for three trials.
5) Finally, select an mp3 track with a tempo much faster than the ropes' tempo. Again, jump the same routine while listening to the fast track. Record the number of jumps completed without a miss. Rest between trials, so you don't get too tired.
6) Allow each girl who wants to jump to have a turn, going through all the trials.

SciGirls Secret

There are a lot of factors that can influence the outcome of this investigation, and it's difficult to manage them all, but discuss this point with the girls: Which confounding factors (e.g., fatigue, trick difficulty, the jumper's emotional state) can be managed and held essentially constant, and which factors might affect the outcome unintentionally?

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SciGirls Synthesize

Data and Analysis

1) Human performance data can vary especially widely, but have the girls calculate averages from their results and put the averages into a simple table:

Jumper #	mp3	Slow mp3	Fast mp3
1	14 moves	15 moves	8 moves
2	6 moves	5 moves	7 moves
3	11 moves	4 moves	5 moves

2) Discuss how much weight to assign differences in the number of jumps for each jumper. For example, for jumper #1, is it credible to conclude that listening to slow music significantly improves her jumping? Probably not. But it might be fair to say that the fast music caused her to miss moves sooner than listening to slow music. Interview the jumpers about their experiences to get additional evidence. Use this opportunity to discuss the validity of their results.

Keep Exploring!

As an optional investigation, try doing the test in a light-dimmed room, flashing a strobe light. The strobe will make it somewhat difficult for the jumper to sense where the rope is. But perhaps her sense of hearing will detect the slap of the rope on the floor, and this sound will be enough to overcome the visual distraction of the strobe. Does hearing win over vision in helping a jumper complete moves?