

NINJA WALK WITH SCIENCE JOURNAL

Can you move as smoothly and silently as a Ninja? In this experiment, participants will use their stealthy Ninja skills to move through a noisy obstacle course while wearing a smartphone. They must figure out how to navigate around obstacles with the sound sensor and accelerometers detecting as little motion and sound as possible.

Duration: 30-60 minutes

Institution: The Tech Museum

Age Level: 8 to adult

TOOLS AND MATERIALS:

- Smartphone with the Science Journal app
- Protective phone case (recommended)
- Armband phone holder
- Obstacle course materials:
 - Large, soft blocks - couch cushions are a great option
 - Soft squeaky dog toys
 - Thunder sticks
 - Bubble wrap
 - Ball pit balls
 - Rubber chickens
 - Jingle bells
 - Present bows
 - Whoopie cushions

TOOLS AND MATERIALS (OPTIONAL)

- Tape

KEY STEM SKILLS:

- Data literacy and experimentation; changing actions to produce graphical representations defined by constraints and variables.
- Data literacy; connecting actions with their graphical representations.
- Defining and testing variables.

NEXT GENERATION SCIENCE STANDARDS:

- *3-5-ETS1-2 Engineering Design*: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

BUILDING A NINJA WALK OBSTACLE COURSE:

The obstacle course can be made out of a variety of fun materials. Use items that you have on hand! Look for materials that are noisy when touched or stepped on, but have a low risk of cause the tester to slip. Items may need to be taped to a surface to prevent tripping. Define the boundaries of the course with either large objects or tape. The best obstacle courses have materials attached from all angles. Look for ways you can create traps from above, below and on the sides of the course. Try to find a wide variety of items that make different noises to surprise the tester, such as squeaking, crunching and popping.

EXPERIMENT:

1. Open the X-axis, Y-axis and Sound Sensors on the Science Journal app. Secure phone in the armband.
2. Place the armband on tester and explain that they must move through the course as smoothly and quietly as possible, because the accelerometers and sound sensor will pick up any sound or motion.
3. Demonstrate the accelerometer by moving the phone and showing how the graph peaks.
4. Show that even when we are not making noise, the sound sensor will pick up on ambient sounds from the environment. They will need to subtract this range of numbers.
5. Start recording by pressing the red circle and motion to the tester to begin. Make sure the environment stays as quiet as possible while the tester goes through the course.
6. Stop the recording by pressing the black square. Analyze the results with the tester.
7. Where did they make the most noise?
8. Where did they make the most motion?
9. How can they change the way they navigate the course for better results?
10. Encourage testers to try the course multiple times with different strategies for navigating the course.

FURTHER INVESTIGATIONS:

11. For an outdoor variation, try this experiment out on the playground or your backyard! Although the sound graph may not vary as drastically, the movement results will be dramatic.
12. Have the tester complete the course with earplugs, earmuffs or ear protection so they can't hear when they trigger sounds. Let them experience the noise afterwards by interpreting their graph.