CIRCUS
educational materials

CIRCUS EDUCATIONAL TRANSCRIPT: EPISODE 07: CENTER OF MASS

TIMECODE:	AUDIO:
00:00:02	(Music)
00:00:13	JESSICA NANJING:
	I with An Nan 15 years.
00:00:16	AN NAN NANJING:
	Yeah very long time.
00:00:18	JESSICA NANJING
	Ballet and the acrobat together.
00:00:23	GLEN HEROY:
	How does Jessica stand on point on top of An Nan's head?
00:00:28	AN NAN NANJING:
	For starters it's very difficult. Difficult trick you know?
00:00:32	JESSICA NANJING:
	It's a very hard act.
00:00:34	GLEN HEROY:
	How does she keep such perfect balance and not fall off? A major part of this act is balance. Jessica always keep her center of mass directly above An Nan's – so even though she's standing on a smaller, less stable surface than An

Nan – as long as her center of mass is directly over the pivot point which is An Nan's head, she won't fall.

00:00:59 When she's standing straight, square on his shoulders, this is easy enough. But what about when she gets on her toes on the top of An Nan's head? You'll notice that Jessica extends her arms on either side and kicks her leg out behind her for balance. That's because as her center of mass moves over the pivot point, she needs to balance and counter-balance.

00:01:22 Try to balance on one foot on tiptoes. If you put one arm out, you'll feel yourself tipping over. That tipping is coming from the torque of gravity on your arm. When you extend your other arm, your balance is restored, because clockwise torques are balanced by counterclockwise torques, just like a seesaw.

00:01:41 Torque is the rotational equivalent of a force. Its makes things accelerate in a circle, and it's what could cause Jessica to fall off An Nan's head. To go back to our seesaw-torque is what makes the seesaw move up and down.

00:01:56 When you're sitting on a seesaw – you balance out the difference in your weight and the other person's weight by sitting closer or farther away from the edge. If you weigh

more than the other person, you'll need to sit farther from the edge to balance out the seesaw. That's because torque is the force times the length from the pivot point. The farther out you are, the more torque there is.

00:02:19 Jessica's net torque is zero when she's standing straight on An Nan's shoulders or when the torques on either outstretched arm are balanced. As long as it's zero, she will not fall.