

Subject weight info (Exp 1):

6 males: 152lbs +/- 36lbs

6 females: 120lbs +/- 21lbs

combined: 136lbs +/- 33lbs

age: 21 +/- 2 years (same for males and females)

Breakaway Data (Exp 1):

1" diameter round rung: males 189lbs +/- 47lbs

females 111lbs +/- 21lbs

1" diameter round rail: males 116lbs +/- 27lbs

females 79lbs +/- 10lbs

2.5" x 3/8" plate rail: males 92lbs +/- 37lbs

females 59lbs +/- 16lbs

Subject weight for Exp 2:

males: 161lbs +/- 14lbs

females: 149lbs +/- 19lbs

age: 22 +/- 3 years

Breakaway Data (Exp 2):

1" diameter round rung: males 172lbs +/- 27lbs

females 139lbs +/- 18lbs

1" diameter spinning rung: males 141lbs +/- 21lbs

females 107lbs +/- 5lbs

What this shows is that most males can hold their BW if holding circular rung with one hand. Strong or light females also. We see that an increase in bodyweight (compare males from exp1 and exp2) does not always mean and increase in breakaway strength. So if you are overweight or obese, you probably cannot hold yourself up even with the rung. It is very unlikely anyone can hold themselves up using the plate type rail.

Fall distance is zero; no inertial/momentum factor.

The edges of the plate rail were not smoothed in any formal fashion. They were just sanded so they weren't sharp. I do not know what is in the field. I would guess that its sharper in the field so that would mean even less capability to hold.

Based on this research and the other studies on orientation and shape (manuscripts being prepared), the vertical plate rails should not be used for climbing. Subjects should hold the rungs. I think that "The preferred rung shape should be circular." should be stated (much like in the SAE equipment access standards). Also, since the rungs should be used for climbing then they need to have a maximum diameter (~2") and not be allowed to be rectangular platforms like a horizontal plate.

Justin Young, author