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Leave the seat down: The physics of droplet streams impacting a free surface NATHAN SPEIRS, RANDY HURD, Utah State University, JESSE BELDEN, Naval Undersea Warfare Center, Newport, TADD TRUSCOTT, Utah State University — Even though toilets are designed for sitting, men often stand to urinate. This behavior can be unintentionally messy and encouragement to sit is often disregarded. In an effort to improve communication, we present a physics-based examination of the overwhelming benefits of sitting to pee. Single droplet impact onto a water surface has been studied intensely for over a century; however, very little is known about the effect of multiple droplet impacts. A single droplet impact predominantly forms a hemispherical subsurface cavity. In contrast, a multi-droplet impact creates a deep conical cavity, often 15 times deeper than the single droplet counterpart. A competition between the cavity formation time and droplet frequency maximize the cavity length and duration, implying that cavity size and shape is dependent on droplet diameter, speed and frequency. Upon collapse, larger subsurface cavities result in the formation of larger jets capable of projecting droplets significantly further than single droplet cavities, emphasizing why even a sharp shooter can create a mess. We utilize high-speed imaging and controlled droplet experiments to unravel the key frequencies and parameters at play, offering several suggestions for those wishing to make the transition.

Tadd Truscott
Utah State University

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