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Effect of Postural Position and Utensil Use on Simulated Pill Swallows

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INTRODUCTION

- Oral drug delivery can be challenging for individuals confined to hospital beds, particularly elderly nursing home residents.
- The relatively large size of commonly prescribed tablets (e.g. potassium, clarithromycin, ibuprofen, alendronate sodium), adherent surface of the drugs (e.g. doxycycline capsules), or taking multiple pills at once increase this challenge.¹
- Nursing Med Pass guidelines suggest crushing medications, particularly when giving multiple medications, to reduce swallowing difficulty. However, not all medications can be crushed due to loss of effectiveness, time-release toxicity, and potential damage to the lining of the esophagus and stomach.^{2,3}
- While Med Pass guidelines vaguely suggest “proper positioning and elevating the head of the bed” to reduce swallowing difficulty presuming that an upright head position allows for an ideal sip size and oral control, there are no specific directions or protocols leaving nursing to discover the best head position for their patients through trial and error.¹
- A growing number of nurses report Speech-Language Pathologists (SLPs) as their first or second point of reference in regards to pill administration.
- Thus, it is critical that we understand how head position affect sip sizes during oral drug delivery in order to accurately educate the nursing staff.
- The purpose of this study was to determine if different postural positions, delivery methods (straw or cup) and number of pills (single vs. multiple) influence the perceived effort of swallowing and sip size taken during simulated pills swallows in healthy volunteers.

QUESTIONS

- 1) What is the effect of bed position on sip size when swallowing a single pill versus multiple pills?
- 2) Does sip size, when taking pills, vary when drinking from a cup or straw?

PARTICIPANTS

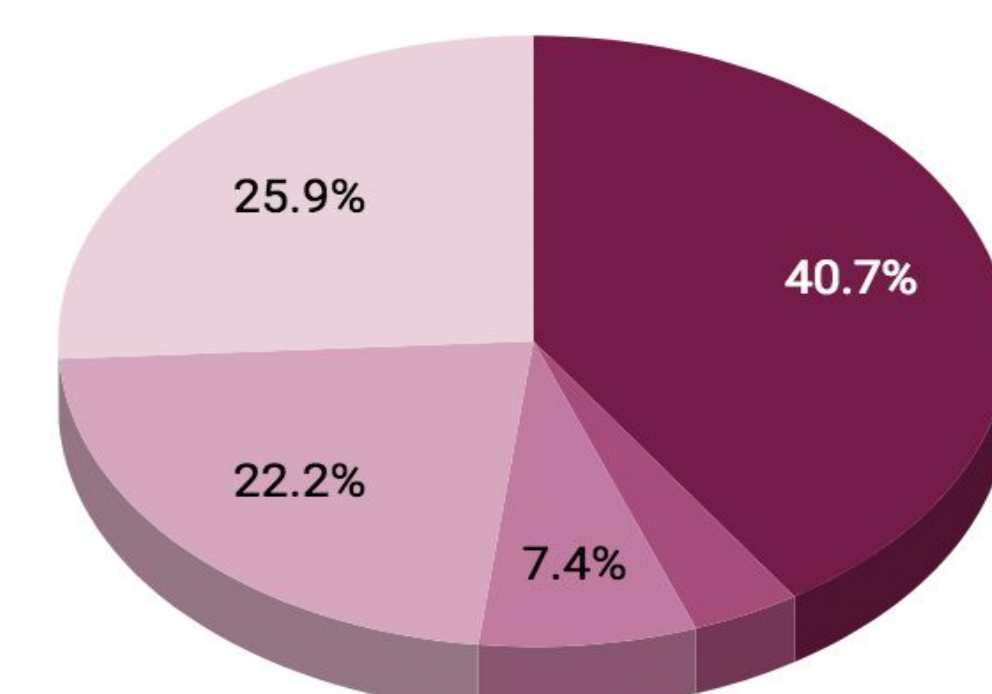
Longwood University undergraduate students, aged 18-22, ($n = 22$), with no experience or instruction in dysphagia or dysphagia related courses including 1 man and 21 women.

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METHODOLOGY

1. Twenty-two participants were seen at the nursing simulation lab at Longwood University using authentic hospital beds with head elevation controls. Participants were randomly assigned to one of two groups: multiple (2) or single pill swallow conditions. Simulation took place within one session.
2. Following administration of a brief inclusionary questionnaire and informed consent, participants were laid down in a hospital bed to 30° angle measured via dial on the bed and verified using a protractor with foot support at a 180° angle (see Condition 1).
3. Participants were given 100 g of water measured using a Unishow digital scale with precision up to .02 grams and a McKesson translucent plastic cup. Participants were handed the cup with a straw in it bent at 90° and a pill cup containing a single empty PuraGenX gelatin capsule.
4. Participants were instructed to “take this like you would take a pill”.
5. The amount of water swallowed was measured by subtracting the weight of the cup after the sip to calculate sip size in grams.
6. Steps 3-5 were repeated with the exclusion of the straw (see Condition 2).
7. The hospital bed was re-positioned at a 65° angle measured via dial on the bed and verified using a protractor with foot support at a 180° angle (see Condition 3). Water in the cup was filled to 100 g and measurements were repeated.
8. Steps 3-5 were repeated with the exclusion of the straw (see Condition 4).
9. The participants in the multiple pill swallow group followed the same steps. A pill cup containing 2 empty PuraGenX gelatin capsules were used.

Figure 1: Most Difficult Swallowing Condition Reported by Participants for Either Single or Multiple Pills



Legend: 30° Straw (light purple), 65° Cup (dark purple), 65° Straw (medium purple), 30° Cup (light blue), No Position was Difficult (light pink)

CONDITIONS

1 - 30° straw



2 - 30° cup



3 - 65° straw



4 - 65° cup

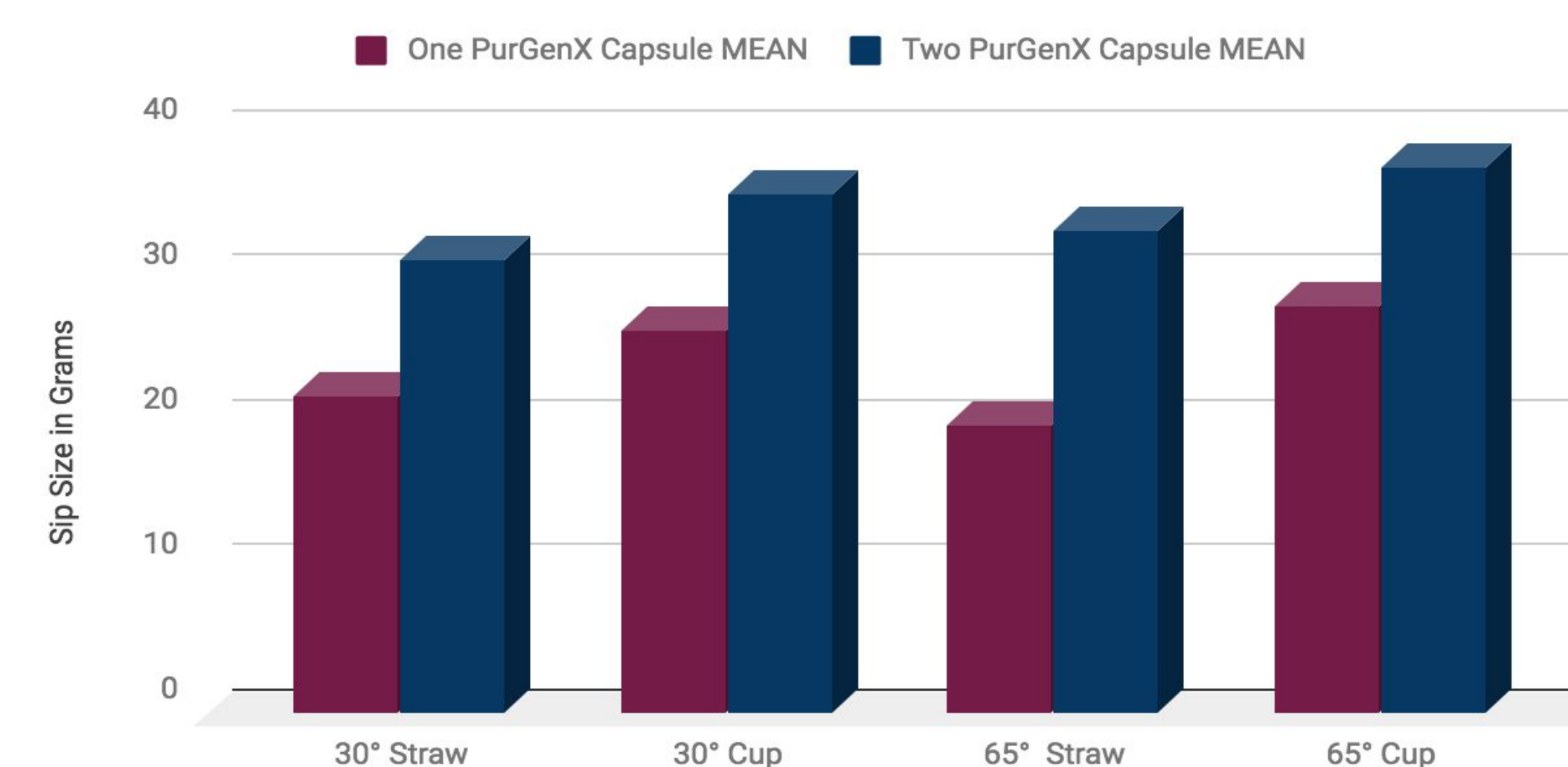


DATA

Table 1: Means and Ranges of Sip Size (in grams) for Head Conditions & Utensil Use During Single & Multiple Pill Swallows

	Single Pills			
	30° Straw	30° Cup	65° Straw	65° Cup
Mean	21.84	26.42	19.9	28.15
SD	10.22	14.8	9.69	17.04
Range	7.01 - 41.87	13.48 - 66.42	8.76 - 44.72	9.98 - 70.94
	Multiple Pills			
	30° Straw	30° Cup	65° Straw	65° Cup
Mean	31.32	35.79	33.32	37.77
SD	11	9.76	10.13	12.34
Range	12.02 - 50.47	23.62 - 56.99	17.33 - 56.26	20.18 - 66.31

Figure 2: Means (in grams) of Water Swallowed at Each Condition



RESULTS

- As can be seen in Table 1, cup sips were consistently larger than straw sips across all 4 conditions ($t = -2.30233, p = .015$).
- Figure 2 shows the comparison of cup and straw sips across conditions. Cup sips for multiple pills were nearly 1 teaspoon larger than sip sizes for either position (>4 g).
- Sip sizes were largest for multiple pill swallows compared to single pill swallows ($t = -4.06, p = .0001$).
- The ranges and standard deviations were large for each condition suggesting increased inter-subject variability.
- Ratings of the “most difficult condition to take pills” varied across the 4 conditions. While 40.7% identified the 30° angle with a straw as the most difficulty, 22.2% found this angle most difficult when using a cup (see Figure 2).

DISCUSSION

We hypothesized that sip sizes would vary based on head position and utensil use. Visual inspection of the data, however, shows very minimal differences in sip sizes based on head elevation. That is, when sipping through a straw or drinking from a cup at both reclined positions, sip sizes were about the same. The utensil used during medication administration, on the other hand, had a significant impact on sip size for participants taking single or multiple pills. When taking multiple pills, more water is needed in the oral cavity in order to effectively swallow the pills.

WHATS NEXT?

This is an ongoing study that will continue comparing postural positions and conditions, as well as foot position to see if there are any significant effects. As we continue this study to include 90 angle both with and without foot support, it will be interesting to compare sip sizes among the different conditions. Further studies could investigate individuals with dysphagia. This study should be replicated using patients with swallowing difficulties to determine if sip size variations are impacted by postural position and use of cup and/or straw.

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