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The Effects of Focus of Attention on Ambulation in the Acute Care Setting

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CRITICALLY APPRAISED TOPIC

Title: The Effects of Focus of Attention on Ambulation in the Acute Care Setting

Clinical Scenario: The patient who led me to pursue this question is a 79 year-old female with a diagnosis of an acute exacerbation of congestive heart failure who ambulates short distances with a front-wheeled walker (FWW) at baseline. Medical treatment to date has included intravenous Lasix for three days, daily weighing, implementation of a 'cardiac diet', and daily physical therapy. The patient was also instructed to ambulate three times per day with nursing and to sit up in a recliner chair three times per day for at least 1-hour each, preferably during meals. Problems identified include deconditioning due to illness, gait deviation, impaired balance and decreased activity tolerance. When I saw her one day after hospital admission, she required moderate assistance for transfers and minimal assistance during ambulation with verbal cues required to maintain posture, take larger strides, and widen her base of support. During ambulation with this patient, I noticed that I was being inconsistent with my focus of attention during verbal cues, switching between internal focus (e.g., "try and make your steps larger") and external focus (e.g., "look up at that exit sign down the hall when you walk"). Both types of verbal cues seemed somewhat effective, although the external focus seemed to have a longer-lasting effect during treatment than the internal focus, which the patient seemed to easily forget.

Brief introduction: For the purposes of my clinical question, I want to know what the research says about the effect of external compared to internal focus of attention, in regards to verbal cues, on patients that ambulate with a FWW at baseline. The patients in the telemetry unit of the hospital often have a medical history of congestive heart failure, deconditioning due to prolonged bed rest in the ICU, or are recovering from acute illnesses such as pneumonia. All of these patients require ambulation throughout the day to improve their activity tolerance, and often they are ambulating with a FWW either at baseline or during their hospitalization. Due to the benign nature of verbal cues, the specificity of focus of attention is somewhat non-controversial. However, it is an important aspect to consider each aspect of therapeutic interventions since individuals are hospitalized for such a short time (to cut costs and to decrease the likelihood of nosocomial infections) and they need to make dramatic changes in medical status in order to be discharged.

My Clinical question: Is an external focus of attention more effective than an internal focus of attention when providing older adults with verbal cues for ambulation with an assistive device in the acute care setting?

Clinical Question PICO:

Population –79-year-old woman with a diagnosis of acutely exacerbated congestive heart failure who ambulates short distances with a FWW

Intervention – Use of verbal cues with an external focus of attention

Comparison – Use of verbal cues with an internal focus of attention

Outcome – Improved task performance measured either qualitatively or quantitatively

Overall Clinical Bottom Line: Based on the results of the two studies by Chiviacowsky *et al*., and Wulf *et al*., it is beneficial to provide healthy adults an external focus of attention, and that focus should be specific to the task goal of the individual. Chiviacowsky and colleagues found that the type of focus of attention (*i.e.,* internal focus on self or external focus on a platform) showed no difference on motor *performance* during the practice or acquisition phase of a skill in which participants were asked to maintain balance on a teeter-totter like device called a stabilometer. However, the external focus group showed statistically significant improvements over the internal focus group at the retention test the following day, indicating better motor *learning*. Wulf and colleagues found that not only does focus of attention (internal versus external) impact the amount of excursion and frequency of adjustments during a balance task in which participants were asked to balance on an inflated rubber disc over a force place while simultaneously holding a pole horizontal, but so does the task to which that attention is directed (the pole versus the disc). When participants were asked to use an external focus of attention, their frequency of adjustments increased and total excursion decreased in the task to which their attention was directed. The authors proposed that the increased frequency of adjustments (as measured by mean power frequency of either the force plate vector adjustments or the excursion of the pole) and decreased total excursion (as measured by root mean square error of the force plate vector adjustments or the excursion of the pole) demonstrated that an individual was using more automatic control processes to maintain balance and less voluntary self-adjustments. Although both studies had a PEDro score of 5/10, they varied greatly in internal validity threats. The Chiviacowsky *et al*. study lacked blinding of the investigators, which was a minor threat. The Wulf *et al.* study not only lacked the blinding of investigators, it also had insufficient number and duration of trials to yield good reliability[1], and had a very poor analysis and interpretation of the data making the article difficult to follow. Both studies were laboratory based and used healthy adult populations, making the results difficult to extrapolate to a broader population. Both study designs could have benefited from using a less healthy adult population subset, such as adults with stable, compensated, congestive heart failure as these adults may present more like those in the acute care

setting. While the stabilometer used in both studies yields very accurate quantitative data, it would be helpful to use an outcome measure that is easily accessible to a clinician such as the Berg Balance Scale. Both studies analyzed balance, but balance is only one component of gait that is addressed during ambulatory training in the acute care setting. Many other components of gait would need to be addressed in order to fully answer my clinical question such as motor planning, muscular strength, and neurological coordination. Further research in this area may help to decrease the overall cost of healthcare by providing individuals with the most effective form of verbal cues, which could decrease the total number of treatment sessions and potentially shorten the length of hospital stay by increasing motor learning and not simply motor performance.

Search Terms: external focus, internal focus, balance, focus of attention, physical therapy, gait, older adult, geriatric, Gabriele Wulf

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Rationale for your chosen articles: I first searched the PEDro database with the search terms "focus of attention", "external focus", and "internal focus". This was rather disappointing, as the database did not contain articles that I felt were relevant to my clinical question. The majority of the research for focus of attention deals with the healthy young adult population. I then expanded my search to Ebscohost using the search terms listed above in that order. Adding the search term "older adults" narrowed my search considerably. I found that most articles dealing with focus of attention referenced the researcher Gabriele Wulf from University of Nevada, Las Vegas. I was familiar with this name from my undergraduate research and know she is highly respected in the motor learning community. I then decided to specifically search this author to see what other research she may have published in regards to my clinical question. I selected the most relevant article to my clinical question by this author. Based on the PEDro scores that I calculated from the PEDro criteria, as well as the relevancy of the articles to my clinical question, I have chosen the Chiviacowsky et al. and Wulf et al. articles for my CAT. The two articles I chose had 5/10 scores, while the de Bruin et al. article ranked 4/10. Table 1 presents the PEDro criteria for each article. While the de Bruin article used older adults, which is an important aspect to my clinical question, the groups were not stated to be statistically equivalent at baseline. This was such a large threat to the validity of the study results that I concluded this study should be excluded from the CAT. The Chiviacowsky et al. study included a population of older adults and had a large sample size, making it highly desirable. It also addresses a very relevant portion of my clinical question: the patient problem of decreased balance. The Wulf et al. study also addresses another aspect of my clinical question: the use of an assistive device. By addressing not only internal and external cueing, but also a postural task compared to a suprapostural task (i.e., maneuvering a walker), it allows more depth of insight to my clinical question. Below are the individual article PICOs.:

(1) Chiviacowsky S., Wulf G., Wally R.. An external focus of attention enhances balance learning in older adults. *Journal of Gait and Posture.* 2010; 572-575.

PEDro Score 5/10
Population: 32 older adults (24 female; 60-85 years old)
Intervention: Internal focus group; instructed to concentrate on keeping their feet horizontal throughout the task
Comparison: External focus group; instructed on keeping the markers on the platform horizontal throughout the task
Outcome measures: Time in center (+/- 5 degrees from level) on a

stabilometer with maximum deviation of +/- 18 degrees from center measured in milliseconds

(2) Wulf F, Mercer J, McNevil N, Guadagnoli, M. Reciprocal influences of attentional focus on postural and suprapostural task performance. *2004*; 189-199.

PEDro Score 5/10
Population: 32 university students (no further information provided)
Intervention: Postural and suprapostural tasks with an internal focus (minimizing foot movement or holding hands still)
Comparison: Postural and suprapostural tasks with an external focus (minimizing movements of disk or holding the pole still)
Outcome measures: Center of pressure measured via a force plate converted to root mean square error and mean power frequency

(3) de Bruin ED, Swaneburg J, Betschon E, Murer K. A randomized controlled trial investigating motor skill training as a function of attentional focus in old age. *BMC Geriatrics* 2009; 1471-2318.

PEDro Score 4/10.
Population: 31 adults at least 70 years old, ability to see the feedback marker on the computer screen, score of >25 on the Mini Mental Status Examination, ability to understand German, ability to stand upright independently, and without terminal, acute, progressive or unstable chronic illness
Intervention: Internal focus group; instructed to look at visual feedback of a center of gravity point on a Biodex and imagine it was their belly, then to volitionally move this point through exertion of force through the imaginary point
Comparison: External focus group; instructed that the moving point represented an air bubble in a level that was positioned at their feet on the foot plate, then asked to control the movement of this air bubble while looking at the visual feedback from the Biodex
Outcome measures: Medio-lateral weight shift movements, and time on an unstable platform via dynamic limits of stability (LOS) test

Table 1. Comparison of PEDro Scores

	Chiviacowsy et al.[·]	Wulf *et al.*[¨]	Bruin *et al.*[¨]
Random	√	√	√
Concealed allocation	No	√	No
Baseline comparability	√	√	No
Blind Subjects	No	No	No
Blind Therapists	No	No	√
Blind Assessors	No	No	No
Adequate Follow-up	√	No	No
Intention-to-Treat	No	No	No
Between Group	√	√	√
Point Estimates & Variability	√	√	√
Total Score	5/10	5/10	4/10

Article: Chiviacowsky *et al*., 2010.

Clinical Bottom Line: Based on the article by Chiviacowsky and colleagues, an external focus of attention was more beneficial than an internal focus of attention with regards to verbal cues during balance training on a stability platform in relatively healthy older adults between 60 and 85 years that were enrolled in a physical activity group. Both groups were asked to balance on a teeter-totter type of platform called a stabilometer. One group was instructed to keep markers that were on the platform horizontal throughout the task (external focus cueing), while the other group was instructed to keep their feet level throughout the task (internal focus cueing). Both groups demonstrated statistically significant improvement during the practice phase on the same day (trial #1-trial #10), but only the external focus group showed statistically significant improvement from the end of practice to the end of retention testing which was on the following day (trial #10-trial #15). Providing either type of verbal cues had no adverse effects and no cost. Both groups displayed an improvement in motor *performance* after the practice phase; however, the external focus group outperformed the internal focus group at the retention test performed on the following day, suggesting an improvement in motor *learning*. The only significant threat to internal validity (PEDro score 5/10) was the lack of investigator blinding, but this threat was minor and did not compromise the overall validity. The only significant threat to external validity is that the subjects were healthy older adults that took part in a physical activity group for recreation. This may compromise the ability to extrapolate the results to many older adults in the acute care setting who may have less motivation, be less active at baseline, have more co-morbidities, and have a lower level of health literacy. Future studies should include a less healthy, though medically stable, adult population such as adults with compensated congestive heart failure that may be more representative of patients in acute care settings. It would also be helpful for studies to include an outcome measure such as the Berg Balance Scale (BBS) to assess balance that is more readily accessible to an inpatient therapist than a stabilometer. A study could be designed to use only internal or only external cueing with patients throughout a training session, or series of sessions, and then test each group in a pre-, post-, and retention schedule with the BBS.

Article PICO:

Population – 32 older adults (24 female; 60-85 years old)
Intervention – Internal focus group (n=16); instructed to concentrate on keeping their feet horizontal throughout the task
Comparison – External focus group (n=16); instructed on keeping the markers on the platform horizontal throughout the task
Outcomes – Time in center (+/- 5 degrees from level) on a stabilometer with maximum deviation of +/- 18 degrees from center measured in milliseconds

Blinding: There was no blinding of subjects, or assessors. However, because the data collected were entirely objective (quantitative measures collected by a computer program), the blinding of the assessors was not a significant threat to validity. The directions provided by the investigators to each subject was standardized, but the lack of blinding to the investigators was still a significant threat as the intonation or intensity of their voices may have been inconsistent between groups due to personal bias, and this may have affected the subjects' motivation throughout trials. The subjects were unable to be blinded to group allocation due to inherent nature of the task, and while this was a threat to the outcome of the study, I believe the threat was minor, as participants did not know how treatment varied between groups.

Controls: The two groups received the exact same treatment with the exception of the verbal cues for the task (the independent variable) that were standardized for each group. It appears that any appreciable difference between groups was attributed to the intervention itself.

Randomization: The subjects were randomly assigned to one of two groups, and these groups were stratified based on sex of the patients. This resulted in an equal number of men and women in each group. I do not think stratification was necessary as I searched the literature and did not find any articles that cited sex differences in balance or attention to instructions. The authors did not perform descriptive statistics demonstrating that the groups were similar at baseline. However, randomization with respect to baseline performance on the task (during the practice phase) appears to have been successful based on a figure provided in the table and a statement the authors made in the discussion section.

Study: This study was a randomized controlled trial consisting of 32 older adults ages ranging from 60 to 85. There were 24 females and 8 males who were all recruited from a physical activity group for older adults that were associated with the University of Nevada, Las Vegas. The task that all subjects were asked to perform was to stand on a balance platform that tilted to the left and right. The internal focus of attention (IF) group was instructed to keep their feet horizontal on the platform. The external focus of attention (EF) group was instructed to keep two markers located on the platform horizontal during trials. Subjects were provided these attention focus reminders before each trial.

<u>Outcome measures</u>: The primary outcome measure was how close to horizontal each subject kept the platform he/she was standing on. Measurements were provided via computer data collected from a stabilometer. This stabilometer apparatus consists of a wooden platform measuring 130 cm X 140 cm that balances like a teeter-totter with a maximum deviation of 18 degrees to each side. The participants were instructed to keep the platform as close to horizontal as possible during their thirty-second trials with the addition of either the internal focus or external focus cues. These data were collected for each individual trial; however, the time points I am most interested in for my clinical question were:

trial one, and ten (the first and last of the practice period) which will show change across a single session, and trial 15 (the final trial of retention testing) which was performed one day later to show learned behaviors over time. The outcome measure that was collected was 'time in balance' which was defined as +/- 5 degrees from horizontal. Both the practice phase and the retention test are relevant to my clinical question. The practice phase is important because it may relate to the short-term benefits of one treatment, which could clinically translate to *motor performance* of a skill within a single PT session. The retention test, even though it only measured carry-over of one day, is important because any carry-over is vital to success after hospital discharge; this retention could be considered as a measure of *motor learning*. In this study, the more effective treatment would show whether motor learning took place, and would result in subjects demonstrating better motor performance at the retention-testing phase one day later. The authors did not provide raw data. Therefore, the values I used were measured with a ruler on Figure 2 provided within the study. Reliability and Validity: While the reliability of the outcome measure was not addressed in this study, Murray in the journal *Perceptual and Motor Skills* found the instrument to have both high content and construct validity as well as high test-retest reliability when measuring gross motor balance.[2] There unfortunately is no MCID cited in the literature for this task.

Study losses: There were no losses, and all subjects were analyzed into the groups to which they were randomized.

Summary of internal validity: I feel that the internal validity of this study was good (PEDro score 5/10). The outcome measure was reliable and valid, there were no study losses, and the study would be easy to replicate with the information provided. The only aspect keeping the study from having excellent internal validity was that the investigators and subjects were not blinded to group allocation. The lack of subject blinding was a minor threat as participants in each group did not know how treatment varied between groups and they both had the same objective outcome measure. The lack of investigator blinding was the only major threat to the study as their intonation while giving instructions between each trial could have impacted motivation of participants during the trials if the investigators had a personal bias while conducting the study. This threat could have been mitigated by providing the subjects with written or video recorded instruction between each trial instead of verbal instruction.

Evidence: The relevant time points for my clinical question were trial #1 (the first of the practice sessions) compared to trial #10 (the last of the practice sessions on the same day) to show change that could clinically take place within a single PT session (*i.e.*, motor performance), as well as trial #10 compared to trial #15 (the last of retention testing that took place the following day) to show the carry-over effect of the skill to the next day (*i.e.,* motor learning). Table 2 shows the estimated timepoints (assumed to be mean seconds for each group) that I collected from a single line graph contained within the article. The authors found

a statistically significant difference within groups for both the practice and retention testing, but not for between groups during the practice phase. Between groups, the external focus group statistically outperformed the internal focus group by spending more time 'in balance' during retention testing.

Table 2. Seconds in balance on the stabilometer

	Trial #1	Trial #10	Trial #15
	Motor Performance		Motor Learning
Internal Focus	5.5	7.0	9.7
External Focus	6.4	12.0	13.5

Both groups showed statistically significant improvement in motor performance during the practice phase (trial #1-trial #10), meaning that they spent more time 'in balance' on the tenth practice than on the first practice on the stabilometer. However, only the external focus group displayed a statistically significant improvement in scores from the end of practice to the end of retention testing (trial #10-trial #15). Thus, although both groups improved equally during the practice phase, only the external focus group demonstrated a statistically significant improvement at the second day retention test. The authors concluded that this was due to a true motor learning effect. This would mean that groups with an external focus of attention while in balance on a stabilometer learn the task better than those who practice with an internal focus. Clinically, we can extrapolate this to mean that individuals performing a balance task may demonstrate a greater level of motor learning when provided with external focus of attention cues during their practice than if they were to have internal focus of attention cues. However, if the difference in the amount of time 'in balance' between internal and external focus cues is only 4 seconds (as it was in this study), the amount of clinical relevancy is questionable and further research is required to understand if 4 seconds on a balance platform is enough time to facilitate a true difference in functional movement performance in the clinical setting.

Applicability of study results:

Benefits vs. Costs: The authors' analysis of the data leans towards favoring an external focus of attention compared to an internal focus when providing verbal cues during a balance task. There is no cost to providing either intervention, no adverse events, and the time commitment is the same for internal and external cueing. Therefore, including external cueing may have a positive effect on elderly patients and should be used throughout treatment, although perhaps not exclusively. Since there are no costs, cueing focus could be changed based on the individual patient's response to the cues.

Feasibility of treatment: The study was provided in enough detail to be reproduced. I would not use this outcome measure in the acute care setting (*i.e.*, having older adults balance on a stability platform). Extrapolating the intervention

to ambulation in the acute care setting with the appropriate assistive device is something that should be considered.

Summary of external validity: The study had good internal validity that allows it to be generalized to the population that it encompasses, which are healthy older adults. The threat to extrapolating the results is that these healthy older adults that were recruited from a physical activity group through a university program may have had a higher level of health literacy and greater motivation than older adults often seen in the acute care setting. These results can be extrapolated to healthy older adults in a fitness setting, and perhaps some older adults seen in the outpatient setting, but the recommendation is to extrapolate with great caution to the larger subset of older adults seen in the acute care setting as they often have many co-morbidities that could cause them to interpret stimuli very differently.

Article: Wulf *et al*., 2004.

Clinical Bottom Line: Based on the article by Wulf and colleagues, it was beneficial to use an external focus of attention (*i.e.,* focusing on a disc when balancing on one, versus focusing on a pole when attempting to hold one still) with regards to the use of verbal cues. Those cues should also be task specific (*i.e.,* If the goal is to balance, then the focus of cues should be on the disc the individual is balancing on, while if the goal is to reduce upper body adjustments, the focus of cues should be on the pole being held). These results were consistent even with the confounding factor of multiple tasks such as individuals asked to simultaneously balance on a disc and hold a pole still. This task-specific external focus of attention yielded more frequent postural adjustments in university age individuals. This study was a within-subject design in which 32 young healthy participants were asked to balance on a disc positioned over a force plate while holding a pole horizontal that had vertical accelerometers attached to each end. Each of the 32 participants had three trials in each of four conditions: 1. Postural task, internal focus where participants were asked to keep their feet balanced on the disc while focusing on their feet 2. Postural task, external focus where participants were asked to keep their feet balanced on the disc while focusing on the disc 3. Suprapostural task, internal focus where participants were asked to keep the pole horizontal while focusing on their hands 4. Suprapostural task, external focus where participants were asked to keep the pole horizontal while focusing on the pole. The article had a PEDro score of 5/10; however, it had several threats to internal validity including decreased reliability of the outcome measure, lack of assessor blinding, and poor data analysis, interpretation, and flow of the article. Since the authors reported a statistically significant difference in favor of using external versus internal focus of attention during cueing, and there are virtually no risks and no cost to implementing the external focus of attention, the potential benefits outweigh the costs. This study has poor external validity due to its poor internal validity. Future research using this same outcome measure of MPF and RMSE should adhere to guidelines previously researched about the length and frequency of trials needed. Future studies could include a population of older adults with chronic health conditions, as this is closer to the target population of my PICO. Research could also be conducted using an outcome measure that is accessible to clinicians, and also lets individuals use an assistive device (*e.g.*, 6-Minute Walk Test or the Timed Up and Go). The study design could limit verbal cues to different subject pools of either internal or external and use these standardized outcome measures in a pre-, post-, retention design.

Article PICO:

Population – 32 university students (no further information provided)
Intervention – Postural and suprapostural tasks with an internal focus (minimizing foot movement or holding hands still)
Comparison – Postural and suprapostural tasks with an external focus (minimizing movements of disk or holding a pole still)

Outcomes – Postural sway corrections measured as mean power frequency (MPF) collected via center of pressure (COP) coordinates

Blinding: Neither the subjects, assessors, nor the investigators were blinded. The outcomes were objective quantitative data collected via a force platform, which makes the lack of subject and investigator blinding very minor threats. Lack of blinding of the person/s giving the verbal instructions to each subject is a significant threat to validity, as the intonation or intensity of their voices may have been inconsistent across individual subjects and conditions while giving specific directions during each trial, causing participants to have differing levels of motivation during trials.

Controls: There was no comparison group, as each subject served as his/her own control. Each subject performed three 15-second trials in each of the four conditions, the order of each of condition was varied, and therefore one should be able to attribute any trends in the data to the intervention itself.

Randomization: This was a within-subject design.

Study: The study was a within-subject design that included 32 university students who had the same incentive to complete the study (extra course credit). The subjects did not have any prior experience with the task and did not know the purpose of the study. Individuals were asked to balance on an inflated disc that was positioned over a force plate, while holding a pole horizontal that had vertical accelerometers attached to each end. They were asked to keep the pole as close to horizontal while maintaining balance on the disc. The four conditions subjects were tested under included the following: 1. Postural task with an internal focus (*i.e.,* "Focus on keeping your feet balanced while focusing on your feet"); 2. Postural task with an external focus (*i.e.,* "Focus on keeping your feet in balance while focusing on the disc"); 3. Suprapostural task with an internal focus (*i.e.,* "Focus on keeping the pole horizontal while focusing on your hands"); 4. Suprapostural task with an external focus (*i.e.,* Focus on keeping the pole horizontal while focusing on the pole").

Outcome measures: The outcome measures were the root mean square error (RMSE) and mean power frequency (MPF), as these measures capture the total excursion and frequency of postural response via center of pressure (COP) vector changes on a force plate. This is relevant to my clinical question because with verbal cueing, these are the measureable changes and the body's response to a given cue. The authors' hypothesis was that the external focus of attention would lead to an increase in MPF. This hypothesis was based on the "constrained-action hypothesis" that suggests that performers who utilize an internal focus of attention inhibit (or constrain) their automatic motor control process that would normally regulate movement.[3] Thus, having a decreased RMSE and an increased MPF indicates that the subject's body is making continuous adjustments to help achieve success for the given task. This outcome

measure was assessed across three trials and averaged for each of the four attentional focus conditions. Reliability: According to Lafond et al (2004), one way to address the reliability of MPF from COP on a force plate is using the Interclass Correlation Coefficient (ICC) which compares within-subject to between-subject variability and considers the random effects over time.[1] The ICC for MPF was calculated as 0.34 and 0.47 for this study using 120-second trials. Lafond and colleagues argued that greater than five 120-second trials would need to be averaged to reach an ICC with "good" reliability of 0.80. The Wulf et al. study used only three 30-second trials; therefore using the Lafond criterion, the data points of MPF did not have good reliability in this particular study design. Validity: The laboratory force plate that was used (Kistler Corp., Amherst, NY. Model #9286AA) is the gold standard for measuring COP and MPF. There was no MCID listed for COP as a function of MPF, and after performing a search in the literature no MCID has been established for this variable. Study losses: As this was a within-subject design, there were no study losses between each trial. All participants were randomized for order each of the four of conditions.

Summary of internal validity: While the PEDro score (5/10) indicates 'good' methodology, there were three threats to internal validity. The first major threat was the insufficient number and duration of trials to have statistical power and good reliability as reported by Lafond et al. The second minor threat was the lack of assessor blinding; this could have been mitigated by providing individuals with standardized video instruction between each trial instead of verbal instruction. The third minor threat was that the data analysis, interpretation, and writing were difficult to understand.

Evidence: For each of the four conditions, RMSE was reported, which is a measure of the average distance each individual was from 'in balance' or the distance in the coronal plane the pole was from horizontal. MPF, or the frequency of force vector changes during each trial both from the force plate as well as the pole, was also reported. The authors described that a decrease in RMSE implies the participant is improving at the task by spending more time 'in balance'. An increase in MPF implies that individuals are preferentially using their *automatic* motor control processes (instead of pre-planned). Based on this interpretation, the authors had two main findings. First, the authors reported a statistically significant increase in MPF (*i.e.*, increased automatic balance reactions) and decrease in RMSE (*i.e.*, increased time 'in balance') when an external focus of attention was adopted, and this result was independent of the goal of the task. In other words, when subjects were asked to focus on an external cue, they had a decrease in RMSE and an increase in MPF, regardless of whether they were asked to focus on the disc or focus on the pole. The authors concluded that a decrease in total excursion from center was achieved using increased reflexive balance adjustments (*i.e.,* increased MPF), and that those reflexes were more automatic during situations with an external focus of attention (*i.e..* the disc or the pole) was adopted. Second, the authors reported a statistically significant increase in MPF and decrease in RMSE in the specific task being attended to

when compared to a simultaneously performed task. In other words, when subjects were asked to focus on the pole, the total excursion (RMSE) of the pole decreased more than the total excursion of their feet on the disc. Also, their total frequency of adjustments (MPF) of the pole increased more than the frequency of adjustments on the disc. This was also true in the reverse situation, when the feet were the focus, the RMSE of the feet increased more than the pole, and the MPF of the feet increased more than the pole. The specific task being attended to yielded more favorable results than the subsequent task being performed. To apply these two key findings to the clinical setting, we might expect that our patients would have a decreased total excursion of their gait if they were asked to attend to their gait - regardless of an additional task. This decreased total excursion would be more pronounced if individuals were cued using an external focus of attention during ambulation when compared to an internal focus of attention. To extrapolate these results to a patient in the acute care setting, therapists often need to provide individuals with a new assistive device such as a cane or walker upon admission, or a cardiac pillow after open-heart surgery. These items could be considered as the secondary task (or "suprapostural task" as referred to by the authors) that the person needs to perform in conjunction with the primary task (or "postural task"), which is the individual's gait. To provide a clear path for gait training, the therapist may have a taped off 'lane' down the hallway, or use the walls as a visual guide. If the therapist is most concerned with correcting the patient's gait deviations then, according to this study, the verbal cues should be specific to the patient's gait - regardless of whether the patient is using an assistive device (*i.e.*, performing a secondary or 'suprapostural' task) during ambulation. The external focus of attention was more beneficial in this study, therefore cues should be targeted at external stimuli such as "try to maintain an even distance between the two walls, or the two pieces of tape when you walk down the hallway". According to the authors' data, the individuals would have fewer balance excursions and be readjusting at a higher rate to maintain the decreased excursions than if you told them to keep their feet between the lines (an internal cue). On the contrary, if the therapist is most concerned about the placement of an assistive device during gait (*e.g.,* a single point cane), then the verbal cues need to be directed toward the goal of proper cane mechanics. The therapist providing an internal focus of attention would be a cue directed toward the use of the patient's upper extremity as he/she held the cane. An example of this would be "try to move your hand with the cane so that it stays with your opposite leg when you walk". However, because an external focus of attention was also found to be more beneficial in the case of a secondary or 'suprapostural' task, it may prove more beneficial to use cues directed at the assistive device such as "try to land the tip of the cane at the same time as your opposite foot". From the results presented in the article, it is clear that the goal of the task has the largest effect of where to direct the cues, but regardless of that goal the cues should be externally focused in nature.

Applicability of study results:

Benefits vs. Costs: The data favored the intervention of *external* focus of attention during cueing, and it also favored having individuals focus on a suprapostural task (*i.e.,* either the disc or the pole). There were virtually no costs when considering time of the therapists, time of the patients, and no adverse effects reported. This treatment could reduce the total number of treatment sessions required for safe discharge from a hospital setting thus reducing overall cost.

Feasibility of treatment: This study was described in detail to be reproduced easily with the particular equipment. However, the cost of equipment (*e.g.,* force plate and analysis software) does not lend itself as a means of evaluation in the acute care setting. The performance of the particular intervention (external cueing with the use of an external object) is feasible in the setting.

Summary of external validity: The poor internal validity compromises overall external validity. By not having the appropriate number and duration of trials cited in the literature for reliability, the results are significantly compromised. The demographics of the subjects (university students) are also very different from the population in my clinical question making it difficult to extrapolate the results to another population regardless of compromised validity.

Synthesis/Discussion: Based on the results of the outcomes from Chiviacowsky et al. and Wulf et al., it is beneficial to provide healthy individuals with an external focus of attention, and that external focus should be cues related to the specific goal of the task. Chiviacowsky and colleagues found that focus of attention had no effect on motor performance of an individual within a practice session on a single day, but that external focus of attention led to better motor learning as displayed by higher scores at a retention test the following day. Wulf and colleagues used a within-subject design to show that there is a decrease in RMSE (total excursion from balance) and an increased MPF (frequency of postural adjustments to maintain that balance) in individuals with an external focus of attention. In addition to supporting an external focus of attention for all conditions, their data demonstrated that when subjects are asked to dual task, the task that is being attended to with the external cue will yield better results (lower RMSE and higher MPF) than the simultaneous task. Both studies had PEDro scores of 5/10, were laboratory based, and used relatively healthy populations, which makes it difficult to extrapolate the results to patients in the acute care setting. By having future research focus on less healthy adult populations such as those seen in the acute care setting (*e.g.,* adults with stable compensated congestive heart failure), as well as using a more accessible outcome measure such as the Berg Balance Scale or the 6-minute Walk Test, verbal cues with an external focus of attention may have more generalizable results outside of the healthy population subset included within these two laboratory based studies.

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