To be considered for the Collins Memorial Library Undergraduate Research Award, please complete the questions below and submit the form electronically to Jamie Spaine (jspaine@pugetsound.edu). Your answers should be brief (no more than 500 words per question), clear, and detailed.

We're interested in all aspects of your learning process, so answers that detail challenges or problem solving are encouraged. You won’t lose points for encountering obstacles, but we want to know how you overcame them. Students will be evaluated on the degree to which they:

- Make extensive and creative use of library services, resources and collections in a variety of formats
- Clearly state their research problem and situate it within the scholarly context
- Demonstrate enthusiasm, knowledge and competence in their subject area
- Articulate the development of their research skills during the project

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Project Title: Relationship between dynamic balance and isokinetic ankle strength in female college athletes

1. Reflectively describe your literature research process. Tell us how you used library resources or services of any kind (from ILL to online databases to archives collections to meeting with your liaison librarian).

   I started the research for my project in the Exercise Science Junior Research class in Fall, 2010. The purpose of the class was to gain experience in developing a body of literature surrounding a topic of interest, designing a protocol intended to investigate a specific question and/or hypothesis, and to practice writing grant proposals. When I started thinking about the topic that would become both my summer research project and my senior thesis, my first instinct was to continue with my line of research from the previous summer. I had recently finished a project investigating the effect of visual and verbal feedback on isokinetic peak torque production of the knee joint, and was frustrated that I had failed to find any significant results. I thought that if I narrowed my subject pool to a direct comparison between cross country runners and rowers that I might find a significant relationship due to the differences in common coaching practices between these two sports. However, I soon decided that I wanted to investigate a completely different project that was more in line with my interest in rehabilitation and sports injuries. Although this initially meant much more work for me, as I had decided to design a project that did not piggy back off of any previous work done by the professors and students in the Exercise Science Department, I found it
quite easy to utilize SportsDiscus and PubMed to find a topic that could be supported both by extensive literature and testing equipment available to me at Puget Sound.

I chose to investigate the relationship between isokinetic hip abductor and adductor and ankle plantar- and dorsiflexion strength and static and dynamic balance. I therefore focused on 1) research methods to measure and quantify strength, 2) research methods to quantify static and dynamic balance, and 3) any trends and/or relationships that had previously been established between these variables. I was able to effectively utilize the library's search engines and online databases to find relevant titles or abstracts. I was generally able to quickly link to a full-text PDF within seconds or receive the article via Illiad within a few days. I found journals such as the American Journal of Sports Medicine, Isokinetics in Exercise Science, Journal of Athletic Training, and Journal of Sports Orthopedics and Physical Therapy to be particularly helpful in my research project. Besides the direct library search engines and archives, I also utilized the “cited-by” option of Google Scholar, which I found to be particularly helpful in finding relevant and recent research articles. I generally found promising articles on Google Scholar to be available through Illiad or even in full-text through Collins Library, which proved to be a very easy and effective method of obtaining articles. Using the library, Google Scholar, and textbook references, I was able to design a research project that satisfied my interest in sports medicine, and that will be relevant to my future as a medical professional.

2. Tell us about a challenge you faced during your literature research and how you overcame it.

The hardest part of designing my research protocol was in determining a reliable and valid method of static balance testing. Many of the common balance tests are extremely subjective and require the tester to maintain entirely consistent balance judgment between subjects. Though many of these tests do have specific criteria in order to aid in consistency, it still seemed very subjective and difficult to maintain consistency from one wobble to the next. Because I was going to be testing 30 subjects across the span of three months, I knew that it would be hard for me to maintain reliable interpretations of balance from my first subject in May to my last subject in July.

My adviser, Dr. Barbara Warren, presented me with a cool solution. She had read about a new piece of balance equipment from CMSi that essentially worked like a Wii Fit balance board. It was supposed to allow me to test the static balance of each leg separately and together and present the results in a simple, quantitative format. She managed to pull some strings in the Exercise Science Department in order to afford the equipment.

I then designed my protocol to include both a “subjective balance test” that I had found in my extensive literature search and this CMSi balance board method of static balance assessment. Although I’m still waiting for the people at CMSi to update my balance board with the appropriate software to assess my data, I have high hopes that it will prove to be a much more reliable and accurate way of quantifying balance.

3. How does your research contribute to the scholarly conversation in your field? What is the significance of your research, in layperson’s terms?
The goal of my research project is to determine the physical components of superior balance. Most important to the existing body of literature, this study can contribute to the understanding of how hip strength and ankle strength are associated with balance. It is necessary to draw consistent conclusions about these relations to better understand the musculoskeletal contributions to balance and how to maximize static and dynamic balance in people of all ages and athletic ability. If postural control and dynamic balance can be increased by strengthening the hip and ankle joints, there could be serious implications for injury reduction programs in elite athletes and elderly people alike.

Most of the literature I gathered agreed that superior balance has been linked with a lower risk of injury to the lower extremities. It is therefore clear that musculoskeletal contributions to balance need to be further assessed and defined. Because common ailments like ankle sprains in athletic populations and falls in elderly populations can have serious implications for function of athletic skills and for day-to-day independence and quality of life, it is important to develop a better understanding of how static and dynamic balance are achieved.

Although I have finished collecting data, I will be continuing to delve into the literature surrounding my project in order to contextualize my findings as my senior thesis. I hope to construct a publishable manuscript to add to relevant literature in the hopes that it will help to draw more consistent relationships between balance and hip and ankle strength. I hope that this information can be adopted by athletic trainers and physical therapists in order to design more effective rehabilitation and injury prevention programs.