I am honored that Dr Krebs and his colleagues have found my work worthy of such careful scrutiny. Research performed in his laboratory has produced excellent work in many areas of biomechanics, especially that related to the hip. Dr Krebs and colleagues raise 2 issues regarding the hip abductor force model that I used in this study. First, they correctly point out that, in the context of the model, it is not possible for the hip abductor force (HAF) and prosthetic hip reaction force (PHRF) to be exactly parallel. Many of my publications1–5 have depicted these forces as essentially parallel, although in reality, the 2 vectors diverge by about 6 degrees. I have believed that this difference was too slight to be distinguished in the illustration, especially since, as stated in the figure legends, the forces were not drawn to scale. This oversight is corrected in the Figure (of this response) by redrawing the hip abductor model used in my article with all forces drawn properly to scale and in their correct orientations.6 The differences in the slopes of the PHRF and HAF in the revised figure and in Figure 3A of the article, for instance, are mathematically insignificant, in my opinion, in the scope of these studies. Furthermore, they do not influence the clinical implications of this research. Nevertheless, I acknowledge my oversight of not more accurately illustrating the 6-degree difference in the HAF and PHRF in my article.

The second issue made by Dr Krebs and colleagues involves my use of what they consider to be an overly simplistic, one-muscle, static model to study a complex, dynamic situation. I agree that the frontal-plane model I have used in this and previous studies is an oversimplification of a much more complex event. I explicitly stated this limitation in the my article (see “Limitations of This Study” section). The primary focus of this research has clearly been to understand the role of the abductor muscle in frontal-plane hip mechanics, not to globally understand the integrated roles of all muscles involved with hip biomechanics. To obtain a more complete picture, data must be produced utilizing far more complex and sophisticated technology, such as that presented from Dr Krebs’ laboratory. Despite its oversimplification, I feel that the model used in my research can be very helpful for teaching the important clinical biomechanics of many forms of hip joint protection. I contend the weakness of the model is small and inconsequential when used in the context of explaining the relative muscular demands on a prosthetic hip during various gait conditions.

The basis for this discussion is, as I understand it, not one of design, interpretation of data, or even the clinical implications of this information. Rather, this is a discussion of the degree to which models should be simplified for the sake of clarity. The important issue is the clinical aspect of “protecting” a failing or prosthetic hip. Fortunately, both of our research endeavors—although using
different methods—agree in principle on several effective ways to minimize undue stress on the hip joint.

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References


