

## RtPtR – Ergonomics in Construction Industry

James Borchardt<sup>1</sup> and Sang Choi<sup>2</sup>

<sup>1</sup>Construction Ergonomics LLC, 6020 Shadowbrook Drive, Bettendorf, IA, USA

<sup>2</sup>University of Wisconsin – Whitewater, Whitewater, WI, USA

Corresponding author's Email: [constructionergonomicsllc@gmail.com](mailto:constructionergonomicsllc@gmail.com)



© Created and Designed by Professor Sang D. Choi

Research to Practice to Research - RtPtR Model Diagram

**Abstract:** The above diagram depicts the concept of Research to Practice to Research (RtPtR) model: the continuous improvement process of academics translating the safety, health & ergonomic (SH&E) knowledge/research findings into best/good practices (RtP) and then practitioners complete the loop by providing feedback to researchers (PtR) (Choi & Borchardt, 2016). As a practitioner who has been using Snook's Tables and NIOSH's Lifting Equation (LE) since the 1980's and 90s, Borchardt realized the importance of being able to determine the weight of construction materials so these assessment tools could be used more easily at worksites. The co-authors explored and developed the B Factor concept that the density of most construction materials were uniform and their weight could be determined by units easy to measure by safety and ergonomics practitioners at worksites (Choi & Borchardt, 2009; Borchardt & Choi, 2012). Liberty Mutual's "redo" of the Snook Tables (2002 -2008) found evidence the psychophysical capacity of today's workers is about 69% of workers studied in the 1970 – 80s. If validated by future research, the set points or load constant (LC) of the NIOSH LE and its derivatives may need to be lowered. These preliminary results also suggest workers may be at greater risk to overexertion from the manual materials handling tasks of lifting, pushing/pulling, and carrying. Consequently, Professor Choi and Mr. Borchardt have begun promoting the concept of Ergonomic Action Level (EAL) where analysis and redesign of manual construction tasks begins at about 70% of the current LC (Borchardt & Choi, 2015). Such a shift suggests utilizing prevention through design (PtD) approach and increased need for mechanization, automation,

modularization and prefabrication (Choi et al., 2014). Moreover, executing “*construction ergonomics*” campaign in construction trades is warranted to develop contractor success stories, and increase education and awareness.

### References

- Borchardt, J.G. & Choi, S.D. (2012). *B Factor and its Importance to HFE Practitioners - Applying NIOSH's 1991 Revised Lifting Equation and its Derivatives*. 56th Annual Meeting of Human Factors and Ergonomics Society, Westin Waterfront Conference Center, Boston, MA, USA, October, 2012. HFES Vol. 56(1), p 1183-1187.
- Borchardt, J.G., Choi, S.D. (2015). *Workers' Changing Psychophysical Characteristics Require Prevention through Design (PtD) Ergonomic Strategies at Construction Worksites*. 19 Triennial Congress of International Ergonomics Association, Melbourne Convention & Exhibition Centre, Melbourne, Australia.
- Borchardt, J.G., Choi, S.D. (2015). *Changing Psychophysical Characteristics of Construction Workers require New Ergonomic Strategies* XXVII International Occupational Ergonomics and Safety Conference (ISOES), Holiday Inn Airport Opryland, Nashville, TN, USA.
- Choi, S.D., & Borchardt, J.G. (2009). *Investigation of Common Construction Materials Weight and Related Manual Lifting Task Observations*. 17th Triennial World Congress of International Ergonomics Association (IEA 2009). Jiuhua International Conference and Exhibition Center, Beijing, China.
- Choi, S.D., Yuan, L., & Borchardt, J. (2014). Critical Analyses of Work-related Musculoskeletal Disorders and Practical Solutions in Construction. Proceedings of the 2014 HFES International Annual Meeting. Human Factors and Ergonomics Society, 58 (1), 1633-1637.
- Choi, S.D., & Borchardt, J.G. (2016). Research to Practice to Research (RtPtR): A Roadmap for Occupational Ergonomics and Safety Practitioners and Researchers. In: Proceedings of the XXVIIIth Annual Occupational Ergonomics and Safety Conference, Chicago, Illinois, USA.