Work Targeting in the Sum™ Chair

Scott Openshaw, M.S.
Biomedical Engineer, Allsteel Inc.

What is work targeting?

As we sit at a desk in a tasking chair, our hands are usually typing on a computer keyboard and our eyes are focused on a monitor. We work in our chairs for a large part of the day, and may often recline while we continue to work. As we recline, we want to be able to target our work throughout the full recline and stay focused on the monitor. This is referred to as "work targeting". Sometimes we may find that the chair we are using makes work targeting difficult because we have to readjust our chair, body, or monitor to work effectively in the new position. The inability to work target as we move in our chair can decrease our productivity.

What influences work targeting?

There is a combination of elements that can influence our ability to target our work and stay focused: good posture, correct placement of the computer keyboard and monitor, and an effective tasking chair.

Posture

Spine experts and ergonomists have urged people to maintain correct posture to prevent back injuries and muscle fatigue while working at desks [Chaffin et. al., 1999]. "Correct posture" is not one specific rigid posture, but rather an acceptable range of postures or positions that our bodies can assume to maintain good spinal curvature and relaxed muscles (Figure 1). As we keep our body in the ranges suggested in Figure 1, we should feel more relaxed, comfortable, and spend more time concentrating on work than our discomfort [Peate and Lunda, 1997].

Figure 1. Ergonomic guidelines for individuals who are sitting encourage good posture to maximize comfort and minimize pain and injuries.

Workstation setup

When working at a desk with a computer, it is important that the keyboard and monitor be placed at the correct height and distance. This will help to ensure appropriate posture for the arms, wrists, and

head, and also help prevent eye strain. The keyboard should be at a height and distance that allows us to maintain the suggested angles of posture noted in Figure 1. If it is too far away, the shoulder, back, and arm muscles will fatigue. Other injuries such as Carpal Tunnel Syndrome can occur as a result of using a keyboard that has been incorrectly positioned [Sheehan, 1990].

The monitor height should be such that the top part of the screen is horizontal with our eye direction when we are looking straight ahead (Figure 1). This will allow us to see the top of the monitor and then move our eyes down to see the rest of the screen. The distance of the monitor to our eyes should also be between 18″ and 30″ to allow us to focus on the screen correctly and not have excessive eye strain [Peate and Lunda, 1997].

The right chair

A tasking chair that helps us achieve correct posture and maintain the proper distance from the keyboard and monitor to our body will allow us to maintain work targeting. Figure 2 shows the difference between a chair that offers work targeting advantages, and one that does not. When reclining or sitting upright in a non-work targeting office chair, we are unable to maintain the correct posture and location for our arms and head (eyes) as it relates to our work. When we are unable to maintain work target, we have to readjust our chair or workspace to correct our posture. Readjusting can take us away from concentrating on our current task. Those of us who do not readjust as necessary end up trying to adapt to the misalignment and add the potential for fatigue, ergonomic discomfort, and decreased productivity.
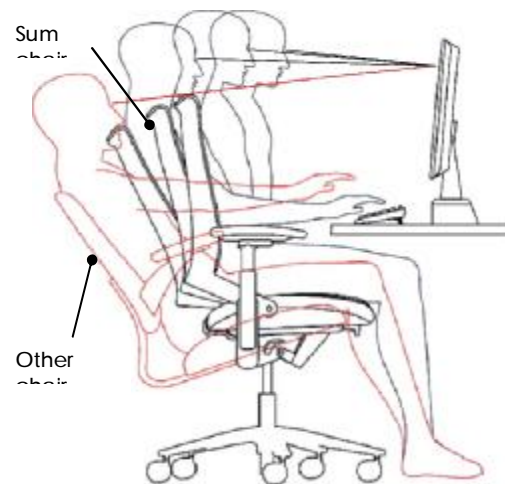
Figure 2. Work targeting in the Sum chair allows us to focus on the monitor throughout our full range of motion. Other chairs do not offer this same advantage.

The Sum chair advantages

The Allsteel Sum chair was designed and engineered with technology that provides users with work targeting advantages as they sit in the chair. Avatar 2™ is the name of this technology, and will be explained below. In addition, the Sum chair was tested against other office tasking chairs to see how well it promoted work targeting. The advantages discovered in that test will also follow.

Avatar 2

The Sum chair uses a weight-balancing technology called Avatar 2 that helps users focus on their work while moving in the chair. As the user reclines, their body pivots about the natural hip region and the seat subtly raises the individual. The raising motion helps maintain a relatively constant line of sight while seated so that users can work target during motion.

Work targeting in action

Eight individuals were tested in 9 different tasking chairs to observe work targeting performance. The individuals adjusted each chair to their liking, and then worked at a computer desk (Figures 3 and 4). They were asked to leave their fingers on the keyboard while they reclined to each chair's position. Photographs were taken of each position to view the difference in movement during recline. Eye height and depth were measured by calculating the change in height (movement up and down) and depth (movement away from monitor) of each individual's eyes. Table 1 shows the averaged results of the horizontal and vertical eye movement of subjects going from the upright to reclined position.

Table 1. Averaged data from 8 subjects that sat in each of the 9 chairs shows the difference in horizontal and vertical movements of the individuals' eyes from upright to full recline.

Chair	Horizontal	Vertical
Allsteel Inc. #19®	9.33	1.55
Herman Miller, Inc. Aeron®	19.23	8.25
Humanscale® Freedom®	13.22	2.86
Haworth Inc. Improv®	8.92	3.30
Steelcase Inc. Leap®	10.66	3.98
Knoll Inc. Life™	10.57	2.69
Herman Miller, Inc. Mirra™	17.67	6.13
Allsteel Inc. Raptor®	7.38	1.71
Allsteel Inc. Sum™	11.35	1.27

All trademarks are owned by their respective owners

Individuals sitting in the Sum chair had an average vertical eye movement of 1.3″. This smaller amount of vertical travel allows the Sum user to keep focused on the monitor during movement, achieving work targeting. Figure 3 illustrates one subject sitting in the Sum chair throughout its full range of motion.

Figure 4, shows another chair that had a larger amount of movement than the Sum. This drastic movement downward can cause the individual to see glare in

the monitor, and strain muscles as he or she tries to reach the keyboard and look upward toward the monitor.

Figure 3. Using Avatar 2 technology, the Sum chair allows users to work target as they recline or sit up. The user's head does not drastically change position vertically or horizontally.

Figure 4. Other chairs do not allow the eyes and head to work target when reclining. This uneven movement downward can cause problems with eye strain, glare from lighting, and muscle fatigue.

When reclining, the Sum chair users averaged 11.4″ of horizontal movement from the upright position. The recommended range of distance from the monitor is 18-30″, or a total of 12″. The majority of the chairs tested had a total horizontal movement that fell in this range of 12″. Other chairs varied between 7″ and 19″. The smaller movement during recline allows for better focus on the monitor and easier reach of the keyboard.

Conclusion

Work targeting allows us to sit at a desk and continue to move in our chair without worrying about having to readjust controls in the chair or the monitor height. Finding a chair that minimizes the amount of travel that our eyes do during chair movement should increase our efficiency and productivity. This document has outlined how the Sum task chair has a suitable design for work targeting.

References

1. Chaffin, D. B., Andersson, G. B. J., and Martin, Bernard J. (1999). *Occupational Biomechanics*. New York: John Wiley & Sons, Inc.

2.   Peate, Wayne F. and Lunda, Karen A. (1997). *Cumulative Trauma Disorders: A Practical Guide to Prevention and Control.* Rockville, Maryland: Government Institutes.

3.   Sheehan, M. (1990). Avoiding carpal tunnel syndrome: A guide for computer keyboard users. *University Computing Times*, July-August 1990, pp. 17-19. Indiana University.