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PASSIVE RECOVERY AND OPTIMAL AROUSAL IN ICE HOCKEY[1]

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Summary.—The present study assessed heart rate on a monitor for four experienced National Hockey League players during game play (shifts) and intershift intervals in 5 games. Mean during play was 168 bpm, recovery time was 3.9 min., and 120 bpm on the bench was average. Results are discussed for their use in individual sport psychological consultation.

The concept of optimal arousal is key to the work of sport psychologists who teach athletes to assess and adjust their level of physiological arousal in competitive situations. Mixed support has been published for the inverted-U hypothesis which is used to explain the relationship between arousal and performance (Gill, 1986). This hypothesis states that performance is optimal at intermediate levels of physiological arousal and that the highest and lowest levels of arousal are associated with lower performance.

During ice hockey performance, an anaerobic sport, it is common that physiological arousal nears maximal levels. Published heart-rate data for Swedish National Team athletes shows on-ice heart frequencies in the range of 175 to 185 beats per minute (bpm), with 200 bpm as a published maximum frequency (Kaczynski, Montgomery, Koziris, Travlos, & Turcotte, 1988; Wilson & Hedberg, 1976). Similar findings have been reported in North America with sustained heart rates of 170 to 180 bpm during an interval of play on ice (shift) which typically lasts less than one minute (Green, Bishop, Houston, McKillop, Norman, & Stothart, 1976).

Of interest in the present study is the preparatory arousal associated with the recovery period between shifts in games. It is proposed that the inverted-U hypothesis of optimal arousal applies to this intershift preparatory interval but not to the shift itself. Exploratory work was undertaken to sample representative levels of arousal for this interval as a precursor to direct systematic assessment of the inverted-U hypothesis for an individual player.

Subjects were four members of a National Hockey League (NHL) team who were assessed over five games. They had an average of 4.3 yr. of NHL experience; their average age was 25.5 yr. Ten periods were used with a period defined as 20 min. of game time not including stopages in play. The equipment was a Model 8799 Uniq heart-rate monitor with a computer

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interface allowing the transfer of stored data to a computer for analysis. The mean heart rate during a shift was 168 bpm ($SD = 12.86$). The range at 145 to 191 bpm was consistent with published reports. The mean recovery time between shifts was 3.9 min. ($SD = 3.3$). The mean heart rate on the bench following a shift was 120 bpm ($SD = 14.57$). The first three minutes of recovery (when a player had three minutes) showed an average of 120 bpm ($SD = 13.9$). These data are consistent with those presented earlier by Kaczynski, *et al.* (1988) although theirs are analogue data and do not derive from recordings of recovery heart rate during a game.

These recordings are taken as a criterion against which the educational sport psychologist can make individual comparisons when consulting with a player regarding optimal preparatory arousal during passive recovery. Having established that an athlete can be expected to show a sitting heart rate of roughly 120 bpm, the athlete can then learn to achieve this level consistently and then assess whether it is an optimal level before learning to make adjustments as necessary.

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