



Police officer in-vehicle discomfort: Appointments carriage method and vehicle seat features



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ABSTRACT

Musculoskeletal pain is commonly reported by police officers. A potential cause of officer discomfort is a mismatch between vehicle seats and the method used for carrying appointments. Twenty-five police officers rated their discomfort while seated in: (1) a standard police vehicle seat, and (2) a vehicle seat custom-designed for police use. Discomfort was recorded in both seats while wearing police appointments on: (1) a traditional appointments belt, and (2) a load-bearing vest/belt combination (LBV). Sitting in the standard vehicle seat and carrying appointments on a traditional appointments belt were both associated with significantly elevated discomfort. Four vehicle seat features were most implicated as contributing to discomfort: back rest bolster prominence; lumbar region support; seat cushion width; and seat cushion bolster depth. Authorising the carriage of appointments using a LBV is a lower cost solution with potential to reduce officer discomfort. Furthermore, the introduction of custom-designed vehicle seats should be considered.

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1. Introduction

Lower back pain and/or discomfort is commonly reported by police officers (Trotter et al., 2009). Two aspects of police work have previously been implicated as causes of lower back pain: driving for long periods of time (Gyi and Porter, 1998), and the carriage of equipment (i.e., “appointments”) on a belt (Kumar and Narayan, 1999). As back pain is one of the leading causes of loss of productive work time (Stewart et al., 2003) any factors which could be linked to back pain within an occupational setting warrant research attention. Police vehicles are highly specialised and modified for police use through the addition of instrumentation and other devices; however, the seat is often overlooked, being no different than that of a normal passenger vehicle, despite the additional demands that are placed on it. One possible source of discomfort may be the interaction between appointments carriage method and vehicle seat design.

Traditional carriage of police appointments is on a dedicated belt worn around the waist. Police appointments include the firearm, spare magazine, handcuffs, capicum spray, and portable radio, amongst others. In New South Wales (NSW), Australia, officers could choose to wear their appointments on a belt or a combination belt with load bearing vest (LBV), at the time this study was conducted. The current study considers the ‘Belt’ alone and LBV belt combination (henceforth referred to as ‘LBV’) carriage options. Both options can be seen in Fig. 1.

1.1. Measuring discomfort

‘Comfort’ as a concept is difficult to define. One way to consider comfort is as “the absence of discomfort”. Alternatively, ‘comfort’ may be considered as being “the opposite to discomfort” (Kolic, 2008). A further difficulty is that the measurement of ‘comfort’ is linked to aesthetic perception (Helander and Zhang, 1997), which may make it more difficult for end users to rate it in an unbiased manner. In consideration of vehicle seats, ‘discomfort’ appears to be of greater relevance than ‘comfort’, as the presence of any discomfort implies a less than ideal situation. Comparison of subjective ‘discomfort’ is a common approach for investigating differences between subjective opinion of seats (e.g., Ahmed and Babski-Reeves, 2009; Donnelly et al., 2009). The relationship between seat features and discomfort is a complex one, with subjective measures

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Fig. 1. Appointments carriage options, 'Belt' only (left), 'LBV' (with belt) (right).

not always being in agreement with more objective physical measures, such as interface pressure (Gyi and Porter, 1999). Nonetheless, as comfort/discomfort is a personal experience, there is significant value to using subjective measures as opposed to objective measures, such as muscle activation (Annett, 2002). As such, the subjective experience remains a key metric of vehicle seat discomfort assessment and the only way to measure an occupant's personal experience.

Although there is a wealth of information investigating seat comfort/discomfort, occupational studies have traditionally focused on office workers. As seating comfort/discomfort is not uniform across environments, it is not possible to infer the outcomes of studies of non-vehicle based workplaces to vehicle based workplaces (Kyung et al., 2008). When considering a seat as a workplace any assessment of its comfort should take into consideration the requirements for the vehicle seat and the activities to be undertaken while occupying it (da Silva et al., 2012; Kolic, 2003). It has been suggested that a seat which is otherwise comfortable may be considered uncomfortable if it is not suitable for the activity demands of the occupant (da Silva et al., 2012).

Subjective discomfort can be measured in a structured manner by questionnaire. One discomfort assessment tool which has been demonstrated to be highly valid and reliable is the Automotive Seating Discomfort Questionnaire (ASDQ) (Smith et al., 2006). The ASDQ was developed systematically and subsequently tested to ensure that results are not influenced by gender and are sensitive to changes of physical seat components (Smith et al., 2006). The questionnaire is designed specifically to identify individual seat features which contribute to discomfort and does not require subject matter expertise to complete. Questions investigate four seat features: upholstery, cushion, back rest and lumbar support, and the sub-components of each feature. The ASDQ is designed to be administered while a vehicle is stationary, thereby allowing participants to identify any physical seat components contributing to their discomfort and to avoid any effect of vibration (Smith et al., 2006).

Vehicle seats pose a specific area of interest for seated comfort/discomfort; in addition to being functional, vehicle seats must also be designed for comfort. Therefore, it may be expected that even when driving is an occupational requirement (as it is for a taxi driver, for example) the majority of occupants would experience 'no' or only 'slight' discomfort (Daruis et al., 2008); although, repeated exposure to a mild but recognisable level of discomfort may contribute towards occupant musculoskeletal pain in the long term (Donnelly et al., 2009).

Occurrence of 'extreme discomfort' is unlikely with modern vehicle seats. Therefore, identifying seats or seat features ascribed a clinically significant degree of discomfort is just as, and perhaps even more, important than identifying statistically significant inter-seat differences (Donnelly et al., 2009). In this context, clinical significance is defined as the minimum discomfort rating corresponding to a clinically meaningful level of subjective discomfort. Donnelly et al. (2009) specify an ASDQ discomfort score of 30 mm or more (on a visual analogue scale, ranging from "0 mm", no discomfort, to "100 mm", extreme discomfort) as being clinically significant. Donnelly et al. (2009) do not provide justification as to why a minimum score of 30 mm was defined as clinically significant. However, an investigation to determine what constitutes a clinically significant change in subjective pain, reports that a difference of at least 9 mm is necessary for clinical significance (Kelly, 1998). Additionally, the same study reports that a 20 mm change corresponds with a relatively large clinical effect, with no influence of age or gender (Kelly, 1998). By extension, it is reasonable to conclude that a discomfort level of at least 30 mm (or 3/10) is sufficiently large to signify clinical relevance.

1.2. Police officer in-vehicle discomfort

The ASDQ has been used previously with a police officer population. In a Canadian study, police officers completed the ASDQ at the beginning and end of each shift (Donnelly et al., 2009). Police officers reported experiencing discomfort due to the lumbar support, the seat width, seat firmness and seat cushion contour. The lower back was rated as an area of significant discomfort, in line with results of previous police officer research (e.g., Gyi and Porter, 1998). Following on from their survey, Donnelly et al. (2009) demonstrated that greater control over the adjustability of the seat lumbar area in combination with an in-built lower back massage system allowed the seat to be set up to minimize pressure on the appointments and, consequently, to reduce discomfort. However, installing in-built massage systems on police vehicle seats would be costly as well as potentially distracting to drivers.

Donnelly et al. (2009) assessed officer discomfort while officers used a belt to carry appointments. Appointments belts have been found to render seat back rests largely unusable and, consequently, to offer little or no support for those officers who wear belts (Kumar and Narayan, 1999). It is possible that alternative appointments carriage methods, such as a LBV, may reduce discomfort; however, no investigations of officer discomfort while wearing a LBV were identified in our literature search.

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