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Texting on mobile phones and musculoskeletal disorders in young adults: A five-year cohort study

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ABSTRACT

The aim was to examine whether texting on a mobile phone is a risk factor for musculoskeletal disorders in the neck and upper extremities in a population of young adults.

In a longitudinal population-based cohort study with Swedish young adults (aged 20–24 years) data were collected via a web-based questionnaire at baseline (n = 7092) and after one and five years. Cross-sectional associations were found between text messaging and reported ongoing symptoms in neck and upper extremities (odds ratios, ORs 1.3–2.0). Among symptom-free at baseline prospective associations were only found between text messaging and new cases of reported symptoms in the hand/fingers (OR 2.0) at one year follow up. Among those with symptoms at baseline prospective associations were found between text messaging and maintained pain in neck/upper back (OR 1.6). The results imply mostly short-term effects, and to a lesser extent, long-term effects on musculoskeletal disorders in neck and upper extremities.

1. Background

Young adults today have grown up with mobile phones as an evident part of their lives. In Sweden in 2012 the access to mobile phones was 99% among those aged 15–24; 82% had a smartphone, and 79% used the phone for SMS (short message service) text messaging on a daily basis (Nordicom and Carlsson, 2013). In a study of university students in the United States, text messaging (SMS) emerged as the most frequently used type of communicative medium (Skierkowski and Wood, 2012). The physical exposure when text messaging on a mobile phone consists of low physical load, repetitive thumb movements and neck flexion (Gustafsson et al., 2010, 2011).

A number of case studies have identified musculoskeletal disorders (MSDs) in the forearm and thumb, for example, tendonitis, tenosynovitis, and first carpometacarpal (CMC) arthritis, in relation to excessive texting on a mobile phone (Gordon, 2008; Menz, 2005; Ming et al., 2006; Storr and d.V.B.F.Stringer, 2007; Williams and Kennedy, 2011). Also, experimental and observational studies have reported on the potential physical risks related to texting. In an experimental study among young adults, we found differences in posture, typing style, and muscle activity while texting on the phone between those with and without musculoskeletal symptoms in neck and upper extremities (Gustafsson et al., 2010, 2011). In the group with symptoms, almost all individuals had the neck flexed forward and did not support their arms. This causes static muscular load in the neck and shoulders. Furthermore, they held the phone with one hand and used only one thumb, implying increased repetitive movements in hand and fingers. This distinguished them from the group without symptoms, in which it was more common to sit with a straight neck, to support the forearm, to hold the phone with two hands and to use both thumbs. Another study observing posture and typing style of college students typing on mobile devices found that almost all subjects had a flexed neck and a non-neutral typing-side wrist; nearly half of them typed with both thumbs, and one third typed with one thumb (Gold et al., 2012). It is previously known that neck flexion and highly repetitive movements are considered risk factors for musculoskeletal disorders (Andersen et al., 2003; Ariens et al., 2002; Grieco et al., 1998; Malchaire et al., 1996; Thomsen et al., 2007). Furthermore, in a cross-sectional questionnaire study with a population of university students and staff associations were found between time spent browsing the Internet using a mobile device and pain in the base of the right thumb, and between total time spent using a mobile device and pain in the right shoulder and neck (Berolo et al., 2011).

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All in all, the mentioned studies indicate that texting can be associated with musculoskeletal disorders of the neck and upper extremity. However, the published studies are case, observational, small experimental or cross-sectional studies. It is important to investigate whether texting is a risk factor for musculoskeletal disorders also in longitudinal studies and in larger populations in order to confirm that there are causal relations rather than spurious correlations. The time spent using a mobile phone and its small keyboard for texting is likely to increase because of the increased multi-functionality of the smartphones.

Due to young adults being a group with intense use of mobile phones in general and for texting in particular (Nordicom and Carlsson, 2013; Skierkowski and Wood, 2012) they are an urgent group to study. Furthermore, the causes of MSDs are multifactorial (Bongers et al, 2002, 2006; Sjogaard et al., 2000; Sterud et al., 2014). We have previously found mobile phone use to be associated with perceived stress among young adults (Thomée et al., 2007; Thomee et al., 2011). As stress, and lifestyle factors such as physical activity can cause or contribute to MSDs, these factors also need to be taken into account.

The aim of the present study was to examine whether texting on a mobile phone is a risk factor for musculoskeletal disorders in the neck and upper extremities in a population of young adults.

Specific research question.

Does texting on mobile phone predict musculoskeletal disorders in a one-year and a five-year perspective?

2. Methods

2.1. Study design

The present study was a longitudinal population-based cohort study with Swedish young adults (aged 20–24 years). Self-reported data were collected via a web-based questionnaire at baseline and at a one-year and a five-year follow-up.

The study received approval from the Regional Ethics Review Board in Gothenburg, Sweden.

2.2. Study population and procedure

In 2007, a cohort of young adults was recruited. Twenty thousand young adults aged 20–24 years (half men, half women) were randomly selected from the registry of the general population kept by the Swedish Tax Agency. Information about the study and that participation was voluntary was included in an invitation letter. A web-based questionnaire was answered by 7125 participants. In the present study those who did not respond to a specific question about SMS use were excluded. Thus, at baseline in 2007 the study group consisted of 7092 (2759 men, 4333 women). At one-year follow-up 4148 (1452 men, 2696 women), and at five-year follow-up 2724 (991 men, 1733 women) answered an identical questionnaire.

A non-respondent analysis at baseline was performed showing that women and native Swedes were overrepresented in the study population (Ekman et al., 2008). A dropout analysis at the one-year follow up showed that those who remained in the study less often worked and more often studied at baseline. They also, had a slightly lower level of mobile phone use compared to the dropouts (Thomee et al., 2011). A dropout analysis at the five-year follow up showed that the participants were more likely to be female, students, to have a higher education level, and to report a higher level of leisure time physical activity at baseline compared to the dropouts (Thomee et al., 2015).

2.3. Text messaging

Information about the number of text messages sent and received was obtained at baseline and follow-ups using the question *How many SMSs on average have you sent and received per day in the past 30 days?* The response categories were 1 = none, 2 = 1–5 per day, 3 = 6–10 per day, 4 = 11–20 per day, 5 = more than 20 per day. In the cross-sectional (baseline) statistical analysis, the categories 1 and 2 were merged into one and used as the reference category.

For the prospective analyses, we constructed the variable *stabile SMS* by combining the reported text messaging from baseline and the one-year follow-up, in order to capture a steadier exposure. A response of category 4 or 5 at both occasions = high stabile SMS and a response of category 1 or 2 at both occasions = low stabile SMS. Those who did not qualify for either “high” or “low” stabile SMS (42%), e.g. if they had response category 4 or 5 at baseline and 1 or 2 at one-year follow up, were not covered by the variable and thus not included in analysis.

2.4. Musculoskeletal symptoms

Information about perceived symptoms in neck and upper extremities was collected using the question *Are you currently experiencing any of the following symptoms?* (a) *Pain in the upper part of the back/neck*, (b) *Pain in the shoulders/arms/wrists/hands*, (c) *numbness/tingling in the hand/fingers*. There were five response categories: 1 = no, 2 = yes, for less than a week, 3 = yes, for 1 week to 1 month, 4 = yes, for 1–3 months, 5 = yes, for more than 3 months. For clarity, there was an illustration in the questionnaire of an upper half body, with references to the body parts mentioned. In the analysis the responses were dichotomized as no (response category 1) and yes (response categories 2–5).

2.5. Demographic variables and potential confounders

Demographic factors were collected from the questionnaire to describe the study group: sex, age, highest completed educational level (*elementary school*, *upper secondary school*, *college or university studies*), and occupation (*working*, *studying*, or *other*, which included being on long-term sick leave, parental leave, or other leave, or being unemployed). General health was assessed by the item *How do you perceive your general health?* The response categories were 1 = very good, 2 = good, 3 = moderate, 4 = poor, 5 = very poor. Further categorization was done by merging the response sets 1 and 2 into good and 4 and 5 into poor (Undén and Elofsson, 1998).

Perceived stress was assessed by a single item, which was an adaptation of a single-item general indicator of stress (Elo et al., 2003). *Stress means a situation when a person feels tense, restless, nervous, or anxious or is unable to sleep at night because his/her mind is troubled all the time. Have you continuously, for 7 days in a row or more in the past 12 months, experienced this kind of stress?* The response categories were yes and no.

Physical activity (leisure time) was assessed by a single question: *How much do you move and exert yourself physically during leisure time? If your activity varies greatly between, for example, summer and winter, try to estimate an average. The question concerns the last 12 months.* Respondents could choose among four possible answers, defined with examples (Saltin and Grimby, 1968): sedentary, light physical activities, regular physical activity and training, and vigorous physical training or competition sports.

Computer use was assessed by a single question: *On average, how much time per day have you used a computer?* Time span was the past 30 days and response categories were <2 h per day, 2–4 h per day, and <4 h per day.