Assessing fitness to drive under long-term treatment with opioid analgesics

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ABSTRACT

Nowadays morphine and morphine-like medicinal drugs are widely used to treat chronic non-cancer pain. Some studies have demonstrated that long-term administration of opioids for non- cancer pain (LONTS) does not impair driving related skills. But there is still a lack of studies investigating actual driving performance.

We compared driving performance of twenty patients in the age between 35 and 68 years, suffering from chronic non-cancer pain and being under long-term treatment with opioid analgesics (fentanyl, buprenorphine, oxycodone, hydromorphone or morphine), with performance of an age independent sample of healthy controls. On-the-road driving tests included a road-tracking scenario and a car-following scenario. The main outcome measures were standard deviation of lateral position (SDLP), time to speed adaption (TSA) and brake reaction time (BRT). Performance of healthy controls with blood alcohol (BAC) concentration of 0.5‰ was used as a reference.

Alcohol increased SDLP of healthy controls by about 2.4cm, which indicates performance decrements. No difference in SDLP was found between patients and controls. Neither TSA nor BRT had proven to be sensitive to the alcohol-induced impairment in healthy controls. No difference between patients and controls was found on these measures, too.

Considered as a whole, it appears that LONTS does not necessarily impair fitness to drive. However, due to the individual variability of test results an individual assessment is always recommended.

Keywords

Automobile driving, psychomotor performance, opioids, chronic pain, road tracking test

INTRODUCTION

The prevalence of chronic pain in the general population ranges from 10% to over 40% (Nickel & Raspe, 2001). Pain is classified being chronic when it persists longer than three months or beyond the time expected for healing of the cause of pain (Mersky & Bogduk, 1994). The pharmacological management of chronic pain has changed over the last decade. Based on an optimistic assessment of the beneficial effects of morphine-like drugs, called opioids (e.g. morphine, fentanyl, buprenorphine), on pain intensity and functional capabilities, the use of chronic opioid therapy for chronic non-cancer pain has increased substantially (McQuay, 1999; Portenoy, 2000). There was a tremendous increase in opioid prescriptions over the past years. In particular, opioids were mostly prescribed to patients suffering from

non-cancer pain (Schubert, Ihle & Sabatowski, 2013). It is well documented that several cognitive functions of chronic pain patients are impaired (e.g. Dick & Rashiq, 2007; Eccleston, Crombez, Aldrich, & Stannard, 1997; Grisart & Plaghki, 1999). Relief of pain can diminish these impairments (Dick et al., 2007; Eccleston et al., 1997; Grisart, 2009). Lagarde, Chastang, Lafont, Coeuret-Pellicer, & Chiron (2005) showed that pain was associated with an increased risk of being involved in traffic accidents.

Opioids are associated with side effects in the gastrointestinal system as well as in the central nervous system. Drowsiness and sleepiness are side effects frequently reported. Both are particularly relevant for road safety (Kalso, Edwards, Moore, & McQuay, 2004; Moore & McQuay, 2005). Several studies showed an increase in accident risk when driving under the influence of drugs and medicines with sedating side effects (Bernhoft et al., 2012; Drummer et al., 2004; Movig et al., 2004). Hence, impaired performance of pain patients under long-term treatment with opioids can be caused either by pain, by the side effects of the opioids or both. It is also well known that these side effects decline over time as tolerance develops (Dellemijn, van Duijn, & Vanneste, 1998; Tassain et al., 2003). Those who use opioids occasionally or habitually are less likely to be impaired (Zacny, 1995) and cognitive ability and psychomotor functions improve over time (Jamison et al., 2003). It was even proposed that the impairing effect of pain is more profound than the impairment caused by side effects of the opioids (Sjogren, Olsen, Thomsen, & Dalberg, 2000).

Several studies examined driving ability of chronic pain patients receiving opioids (Fishbain et al., 2003; Kendall et al., 2010; Mailis-Gagnon et al., 2012). The results of these studies are inconclusive (Sabatowski, Kaiser, & Gossrau, 2010) but it seems that at least a subset of this group of patients is able to drive safely. Unfortunately in most of the published studies only skills related to driving were assessed. Currently there is only one study in which driving performance of pain patients was measured by a standardized on-the-road driving test (Veldhuijzen et al., 2006). Beyond that, most of the published studies focused on particular opioids while most pain patients are treated with combination therapy (e.g. opioid and antidepressant). Therefore, it is particularly important to study this combination therapy, with the opioid being the most potent drug affecting driving ability.

METHODS

The objective of this study was to determine if long-term treatment by opioid analgesics impairs fitness to drive of patients suffering from chronic non-cancer pain. Driving ability was assessed by two standardized driving scenarios widely used in the field of drug research:

the road tracking test (O'Hanlon, 1984) and car-following test (Brookhuis, de Waard, & Mulder, 1994). The impairment caused by blood alcohol concentration (BAC) of 0.5‰ was used as a reference.

Subjects

All subjects gave written informed consent, possessed a valid driver's license for passenger cars and travelled at least 2000 km in the preceding 12 months. They were all still driving on a regular basis (at least once a week). 13 male and seven female patients (see table 1) of the pain outpatient department of the University Hospital of Cologne aged 35 to 68 years (m= 54, sd = 8.91) suffering from non-cancer pain responsive to opioids were enrolled into the study. All patients participated in this study under their current medication. They had been treated for at least four weeks with either transdermal fentanyl (≥ 12 µg/h), transdermal buprenorphine (≥ 10µg/h), slow release oxycodone (≥ 10 mg/day), slow release oxycodone combined with naloxone (≥ 10 mg/day), slow release hydromorphone (≥ 4 mg /day) or slow release morphine (≥ 20 mg/day). The dosage of the analgesic remained unchanged for at least 14 days prior to the assessment. All patients received stable co-medication by antidepressants and/or anticonvulsants below dose limits. They had to abstain from immediate release opioids, benzodiazepines, barbiturates and alcohol for at least two days prior to the assessment. Controls were stratified for age (20-30, 30-40, 40-50, 50-65 years). 12 male and seven female healthy volunteers were included (see table 1). Their mean (sd) age was 43 years (11.07) ranging from 23 years to 58 years. We excluded drivers in case of prior alcohol addiction or abuse, if they were taking medicaments prohibiting the consumption of alcohol as well as consumers of illicit drugs. Women who were pregnant or breast-feeding or women of childbearing potential who were not using a highly effective contraception method (pearl-index ≤ 1) were not allowed to participate.

Since prevalence of chronic pain increases with age and (Nickel et al., 2001) the average age differed between both groups as can be seen in table 1. All subjects received financial compensation for participating in this study.

Table 1: Sample characteristics.

		Patients (N = 20)	**Controls (N = 19)**
age (years)	mean (sd)	54 (8.91)	43 (11.07)
gender	male N (%)	13 (65%)	12 (63%)
	female N (%)	7 (35%)	7 (37%)

driving experience (km/last 12 month):	median km (range)	8500 (1200 - 25000)	12000 (2000 - 50000)
driving license (years)	median (range)	34 (17 - 50)	25 (5 - 40)
duration of pain (years)	median (range)	12.5 (5 - 27)	-
diagnosis (N)	musculoskeletal	16	-
	visceral pain	2	-
	other	2	-
opioid analgesic N (median; dose range)	fentanyl	5 (25 µg/h; 25 µg/h – 75 µg/h)	
	buprenorphine	1 (87.5 µg/h; --)	
	oxycodone	5 (140 mg/d; 30 mg/d – 150 mg/d)	
	hydromorphone	6 (26 mg/d; 16 mg/d – 56 mg/d)	
	morphinesulfate	3 (120 mg/d; 60 mg/d – 140 mg/)	

Study design

This study used a mixed within-between participants design. Treatment of controls was alcohol administration before the driving test vs. no alcohol administration. The medication of pain patients remained unchanged. Hence, patients did the driving test once, whereas controls drove twice. In order to fulfill the safety requirements, all controls had to complete the driving test first sober. Only in case the driving instructor did not expect problems, drivers were allowed to drive under influence of alcohol. Accordingly, it was not possible to balance the sequence of driving, but there was a two weeks delay between both driving sessions. In order to reduce performance improvements during the test drive, all drivers received intensive training with the car prior to the assessment.

PROCEDURE

General remarks

This study (EUDRACT 2009-011774-15 (Effects of opioid analgesics on driving ability of pain patients) was done according to the code of ethics on human experimentation established by the declaration of Helsinki (2008). The German Federal Institute for Drugs and Medical Devices, the Ethics Committee of the University Hospital of Cologne as well as the Ethics Committee of Maastricht University gave approval to this study. The latter became necessary because all driving tests were done in collaboration with Maastricht University on a primary highway in the Netherlands.

The investigator picked up all participants at Cologne university hospital and drove them to Maastricht (see table 2 for the timeline). A Dutch licensed driving instructor accompanied all

driving tests, as well as the familiarization trials. In order to get familiar with the car and the test procedures, prior to the driving test, all drivers had to drive 30 km on a primary highway in the instrumented vehicle by themselves. Breath tests and urine drug screenings verified that subjects did not use alcohol, drugs or medicines besides those according to their prescription.

Alcohol administration

Performance of healthy controls driving under influence of alcohol was used as reference. The amount of alcohol needed to obtain the intended BAC of 0.5‰ was calculated by the Watson formula (Watson, Watson, & Batt, 1981). This formula takes gender, height and weight of the individual into account as well as the time span until the intended BAC should be reached. The total amount of alcohol was split into three parts, mixed with orange juice and administered -60, -40 and -20 minutes before the driving test. BAC was checked before as well as several times during the test drives (see table 2). In case BAC was below 0.5‰ before the driving test, additional alcohol was administered.

Table 2: Timeline of the driving test for patients and controls.

Start [hh:mm]	**End [hh:mm]**	**Patients**	**Controls**
08:30	09:00	medical screening	
09:00	10:30	transfer to Maastricht	
11:00	11:45	familiarization drive	
11:45	12:15	lunch break	administration of alcohol / placebo
12:15	12:30	approaching the starting point of the road tracking test	
12:30	13:30	road tracking test	
13:30	13:45	returning to university building	
13:45	14:00	break	administration of alcohol / placebo
14:00	14:05	approaching the starting point of the car-following test	
14:05	14:45	car-following test	
14:45	15:00	returning to university building	
15:00	15:10	break	
15:10	16:45	transfer to Cologne	

Driving test scenarios

The driving test comprised two different driving test scenarios: (1) road tracking test and (2) car-following test. The road tracking test (O'Hanlon, 1984) was conducted on a primary highway (A79) near Maastricht between the exits Bunde and Heerlen-Centrum. The distance between both exits was 17 km. During the test, which took one hour, participants drove along that section six times (= three times from/to Bunde) which equates a distance of 100km. The

drivers' task was to maintain a constant speed (95 km/h) and a steady lateral position on the right (slower) traffic lane. An optical measurement device mounted at the grill (line-scan camera) continuously measured lateral distance between the vehicle and the road marking. Drivers were allowed to overtake slower vehicles but were advised to drive back to the right traffic lane after overtaking as soon as possible. Data on lateral position was stored together with data on vehicle movements (e.g. speed, lateral and longitudinal acceleration) and inputs by the driver (e.g. steering wheel angle, throttle position) on a computer in the car. In addition a video recording was made. Off-line editing of the data comprised down sampling (30 Hz to 10 Hz) and low-pass filtering (cut-off frequency: 2 Hz). Then all segments with signal loss were eliminated as well as data recorded while overtaking. Of the remaining data mean and standard deviation of lateral position was calculated for consecutive 5-km-segments. An overall measure of standard deviation of lateral position (SDLP) for the complete driving test was calculated by averaging the values obtained for the segments. SDLP is a measure of weaving (see figure 1) and was used as the primary outcome measure. Average speed and standard deviation of speed were calculated in the same way. They were used as control measures.

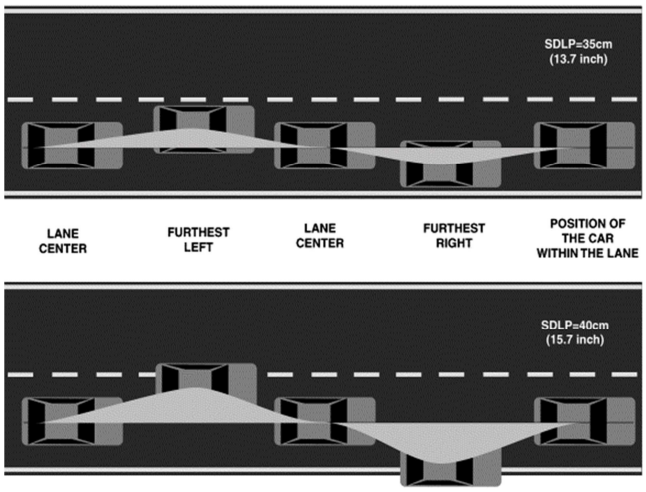


Figure 1: Description of SDLP (Verster, Volkerts, & Verbaten, 2002, S. 263).

The car-following test (Ramaekers, Muntjewerff, & O'Hanlon, 1995) involved the use of two vehicles. The leading vehicle was under an investigator's control. The participant was driving in the following vehicle. The test began with the two vehicles driving behind each other at 95km/h while keeping their speed constant. Subjects asked to follow the leading car at a distance of 50m (time distance: 2 seconds) and to maintain that headway. During the test, the investigator randomly executed sinusoidal speed changes by the aid of a modified cruise-control system. The duration of one such cycle was 50 seconds. Speed changes were done eight times during the car-following test. Randomly the investigator activated the brake lights by a special device. The driver's task was to remove his foot from the accelerator pedal as fast

as possible. At least eight of those brake events were done in the course of the car-following test. A power spectral analysis revealed phase-delay between the speed cycles of both vehicles (cycle frequency = 0.02Hz). Phase delay was converted to an indicator of time-to-speed adaptation (TSA, in seconds). In addition this analysis provided gain and coherence. Both were used as control measures. Gain indicates the amount of overshoot while the participant adapts driving speed to the speed changes of the leading car. Coherence is a measure to control for correspondence between both speed signals. As a second performance measure, brake reaction time (BRT, in seconds) was calculated of the delay between onset of brake lights and release of accelerator pedal.

Rating scales

Performance ratings were assessed by a 10cm visual analogue scale. Subjective ratings of sleepiness were assessed by Karolinska sleepiness scale (Akerstedt & Gillberg, 1990). Scores on the scales ranged from 1 “extremely alert” to 9 “very sleepy, great effort to keep alert, fighting against sleep”. Rating Scale Mental Effort (RSME; Zijlstra, 1993) was used for the assessment of the effort. Participants had to flag a 15cm long axis ranging from 0 to 150. Segemnts of the asis were tagged with verbal categories indicating different levels of effort.

STATISTICAL ANALYSIS

Statistical analyses were done by SPSS 19 for Windows. Superiority testing by general linear model (GLM) repeated measures ANOVA with alcohol (two levels: 0.5‰ vs. sober) was done to check for alcohol induced impairments among controls. Superiority testing by ANOVA for between group comparisons was done to compare performance of patients and controls driving sober.

RESULTS

Between March 2010 and September 2010 20 pain patients and 19 healthy controls completed the driving test. 17 of 20 healthy controls completed the driving test also under influence of alcohol. Only participants fulfilling all inclusion criteria were included into this study.

Alcohol levels

BAC was measured by Dräger Alcotest 6510 breathalyzer. BAC was checked four times in the course of the road tracking test as well as at the beginning and at the end of the car-

following test. As can be seen from table 3, the intended BAC of 0.5‰ was nearly reached at the beginning of both driving tests. BAC of seven drivers (41%) was below 0.45‰ after the first round of the road tracking test. Therefore additional alcohol had to be administered to them during a short break at the roadside. All drivers received additional alcohol during the break between the road tracking test and car-following because BAC was below 0.45‰.

Table 3: BAC (‰) measured during testing (data of controls).

Time of measurement		**Δt [min.]**	**Average BAC [‰]**	**SD BAC**	**N**
Road tracking test	Start	0	0.49	0.11	17
	after 1st round	23	0.49	0.11	17
	after 2nd round	46	0.48	0.07	17
	after 3rd round (end)	69	0.39	0.07	17
Break (alcohol administration)			--	--	17
Car-following test	Start	105	0.45	0.07	17
	End	140	0.35	0.05	17

Performance measures

Only one road tracking test had to be terminated prematurely. This had to be done on request of a healthy volunteer driving sober because he felt too sleepy to go on driving after 2/3 of the designated driving time. None of the road tracking tests had to be terminated prematurely by the driving instructor due to safety reasons, neither of patients nor in the alcohol condition. All drivers successfully completed the car-following tests.

Figure 2 depicts mean (SD) SDLP for all three conditions. Table 4 shows the values and the results of superiority testing. Alcohol significantly impaired driving performance of controls as indicated by an increase in SDLP ($F_{1,16} = 18.39$, $p \leq .001$). Compared to sober driving, SDLP increased on average by 2.43 cm when controls drove with 0.5‰ BAC. No significant difference between patients and controls driving sober was found ($F_{1,37} = 3.705$, $p \leq .062$). But variability of speed of patients was slightly higher than of controls ($F_{1,16} = 4.305$, $p \leq .043$).

While driving drivers had to keep a constant speed of 95 km/h. Therefore average speed was used as control measure. Data analysis revealed that drivers adhered to this requirement in all conditions (see table 4).

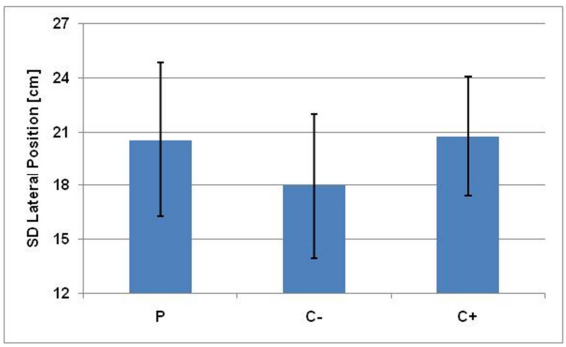


Figure 2: Mean (± SD) of lateral position (SDLP in cm; P = patients, C- = controls sober, C+ = controls 0.5‰).

Performance measures for the car-following test are listed in table 4. When driving under influence of alcohol controls needed longer to adapt their driving speed to the speed changes of the car ahead. Besides, it took them longer to respond to the onset of the brake lights of the car in front. However, this performance decrement was not significant for both measures (TSA: $F_{1,16} = 3.257$, $p \leq .090$; RT: $F_{1,16} = 3.115$, $p \leq .097$). Hence, these measures of the car-following test have not proven to be sensitive enough to the alcohol effect in the study at hand. Although the reaction speed was different between patients and sober controls, this effect was not significant, too.

Table 4: Summary of means (SD) and effects for the three conditions (P = patients, C^- = controls sober, C^+ = controls 0.5‰) in the road tracking test and the car-following test.

	Groups (m (sd))			**ANOVA ($p \leq$)**	
	P	**C^-**	**C^+**	**P vs. C^-**	**C^- vs. C^+**
SDLP (cm)	20.53 (4.29)	18.31 (4.13)	20.74 (3.32)	.062	**.001**
average speed (km/h)	95.24 (1.34)	94.48 (0.93)	94.42 (0.75)	.077	.781
SD speed (km/h)	2.36 (0.66)	1.91 (0.73)	2.23 (0.95)	**.043**	.173
TSA (seconds)	3.17 (1.00)	3.21 (0.82)	3.57 (0.91)	.781	.090
gain	1.19 (0.06)	1.23 (0.12)	1.26 (0.10)	.754	.427
coherence	0.96 (0.03)	0.96 (0.02)	0.95 (0.01)	.999	.465
BRT (seconds)	0.93 (0.29)	0.87 (0.16)	0.95 (0.16)	.410	.097

Subjective measures

None of the sober controls and none of the patients felt unfit to drive. Under influence of alcohol, 14 of 17 healthy drivers (82%) rated themselves as being unfit to drive, three were not sure (12%) and only one driver (6%) considered that he was still fit to drive.

The rating scales used for assessment of performance showed a slight alcohol induced decline in performance for the road tracking test ($F_{1,16} = 6.491$, $p \leq .022$; see also table 5) as well as for the car-following test ($F_{1,16} = 6.683$, $p \leq .020$; see also table 6). There was no significant difference in self ratings of performance between patients and controls. Anyway, drivers judged their performance in all conditions being good: all averaged ratings were above six on the 10cm visual analogue scale ranging from zero (very bad) to 10 (very well).

Ratings on the Karolinska Sleepiness Scale (ranging from 1 "extremely alert" to 9 "very sleepy, great effort to keep alert, fighting against sleep") differed significantly between conditions in the road tracking test (see table 5). Controls felt slightly sleepier when they were driving under influence of alcohol ($F_{1,16} = 4.486$, $p \leq .050$). Patients felt less sleepy than controls in this part of the driving test ($F_{1,37} = 5.708$, $p \leq .022$). However, all averaged ratings ranged between three and five across all conditions, indicating ratings of "neither awake nor sleepy" up to "awake". Statistical analysis revealed no significant differences in ratings of sleepiness in the car-following test between any of three conditions.

By means of a 15cm scale participants indicated their effort to complete the driving task. As depicted in table 5 more effort was needed to fulfill the requirements of the road tracking test under influence of alcohol ($F_{1,16} = 12.690$, $p \leq .003$). The same applies to the car-following test ($F_{1,16} = 24.586$, $p \leq .000$; see table 6). Ratings of patients and of controls did not differ. Although more effort was neede under influence of alcohol, overall effort – even with alcohol – was relativels low.

Table 5: Means (SD) and results of superiority test of subjective measures taken in the road tracking test (P = patients, C^- = controls sober, C^+ = controls 0.5‰).

	Group			**ANOVA (p ≤)**	
	P (N = 20)	**C- (N = 19)**	**C+ (N=17)**	**P vs. C-**	**C- vs. C+**
Performance	7.45 (1.28)	7.21 (1.28)	6.48 (1.56)	.478	**.022**
Sleepiness	3.19 (1.39)	4.00 (1.00)	4.70 (1.69)	**.022**	**.050**
Effort	3.99 (2.94)	3.97 (1.96)	5.52 (2.15)	.896	**.003**

Table 6: Means (SD) and results of superiority test of subjective measures taken in the car-following test (P = patients, C- = controls sober, C+ = controls 0.5‰).

	Group			**ANOVA (p ≤)**	
	P (N = 20)	**C- (N = 19)**	**C+ (N=17)**	**P vs. C-**	**C- vs. C+**
Performance	7.66 (1.27)	7.28 (1.29)	6.57 (1.48)	.309	**.020**
Sleepiness	3.58 (1.79)	3.53 (1.28)	4.04 (1.33)	.901	.192
Effort	3.26 (2.49)	2.64 (1.42)	4.31 (1.56)	.348	**.000**

Correlations to primary outcome measure SDLP

Correlation analysis revealed a positive relation between age and SDLP (see table 7). According to the data, the older the driver was the more he was weaving. This indicated a performance decrement by age. Neither gender nor driving experience or frequency of driving was significantly related to SDLP.

The individual prescription was converted to morphine equivalents. No significant correlation between this measure and SDLP was found (see table 8). Beyond that, the performance of patients was neither related to duration of pain nor was it to pain intensity.

Table 7: Correlation (Pearson) between SDLP and sample characteristics (data of patients and controls driving sober).

Characteristic	**r (Pearson)**	**≤ p (two-sided)**	**N**
Age	0.401	**.011**	39
Gender	0.234	.152	39
Driving experience (km last 12 month)	-0.215	.188	39
Frequency of driving	0.232	.155	39

Table 8: Correlation (Pearson) between SDLP, duration of pain, morphine equivalence dosage and pain intensity (only data of patients).

Characteristic	**r (Pearson)**	**≤ p (two-sided)**	**N**
Duration of pain (years)	-0.042	.861	20
morphine equivalence dosage	0.119	.618	20
pain intensity before driving (cm)	-0.360	.119	20

DISCUSSION

In line with published studies (e.g. Verster et al., 2008) the road tracking test was sensitive to the impairments caused by alcohol. BAC of 0.5‰ deteriorated road-tracking performance of healthy controls, which was indicated by a significant increase in SDLP relative to sober

driving. In contrast, road-tracking performance of pain patients under long-term treatment with opioids was not impaired. Moreover, none of the road tracking tests of patients had to be terminated prematurely although drowsiness and fatigue are well known side effects of opioids. In one recent study the road tracking test was used to study the effects of MDMA on actual driving performance before and after sleep deprivation (Ramaekers, 2011). In this study 20% of driving tests had to be terminated prematurely when participants drove after a night of sleep deprivation. They felt too sleepy to stand this monotonous task.

To date only one further study was done in which driving performance of pain patients was assessed by the road tracking test (Veldhuijzen et al., 2006). But in this study only some of the patients were treated with analgesics. Instead of opioids they were treated with paracetamol and/or NSAIDs. Both agents are known to have only minor impact on cognitive skills (Bradley & Nicholson, 1987; Wysenbeek, Klein, Nakar, & Mane, 1988). The results of this study indicated worse road tracking performance of pain patients. In contrast, pain patients did not perform worse than controls in the road tracking test in the study at hand, although they were driving under influence of opioids. So it seems that effective pain treatment helps to improve fitness to drive.

Both measures of reaction speed derived from the car-following test showed no difference between sober driving and driving with BAC of 0.5‰. Therefore, the car-following test has not proven to be sensitive to alcohol-induced impairments in this study. Although the intended BAC was reached and drivers felt impaired, they did not perform worse. There was no difference in performance between patients and healthy controls, either. Accordingly, the ability of pain patients to react was not impaired. Obviously, the performance measures derived from the car-following test are less sensitive to impairments by sedating drugs than performance measures derived from the road tracking test (Kaussner, Kenntner-Mabiala, Hoffmann & Jagiellowicz, 2012).

In several studies skills related to driving were assessed instead of driving performance (Dagtekin et al., 2007; Gaertner et al., 2006; Sabatowski et al., 2003). In those studies, patients under long-term opioid treatment did not perform worse than controls. Therefore the results of the driving tests from this study are in line with these results. However, future studies should examine larger samples of chronic pain patients to find out if the results are generalizable. In this study, patients treated with different analgesics at different dosages were enrolled. Due to the low sample size, it was not possible to draw conclusions on impairments caused by a certain active agent at a certain dosage. One further problem was to find a sufficient number of patients willing to participate in the driving test. More information is needed on how they perform, because they are still driving. The road tracking test as well as

the car-following test comprise tasks drivers have to cope with when driving on highways or on rural roads. Those tasks drivers have to cope with while driving in cities are not covered.

All in all the results obtained here suggest that patients with chronic pain on stable doses of opioid analgesics are not necessarily unfit to drive. Nevertheless, it is very important to take into consideration that individual differences in cognitive and motor performance do exist. Therefore, an individual assessment is always recommended. Probably only a subset of pain patients on stable opioids is fit to drive, which is also the conclusion of a recent review (Mailis-Gagnon et. al, 2012).

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