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DRUID
Driving under the Influence of Drugs, Alcohol and Medicines

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6th Framework Programme
Deliverable 1.1.2a

Meta-analysis of empirical studies concerning the effects of alcohol on safe driving

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6th Framework Programme
Deliverable D 1.1.2a

Meta-analysis of empirical studies concerning the effects of alcohol on safe driving

Status: Public

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1 OBJECTIVES

One main objective of the DRUID project is to determine the concentration-dependent effects of psychoactive substances on driving behaviour with main emphasis on establishing concentration thresholds. For this objective, different methodologies are applied within the project, for example the epidemiological approach (prevalences, accident studies, risk functions) and the experimental approach (studies measuring performance). In order to combine the results from the different studies, a theoretical framework and an integration methodology are established (Deliverable 1.1.1). Within this framework, alcohol is used as a reference substance for the most relevant psychoactive substances in traffic. Regarding alcohol, numerous empirical results exist and the effects of different legal thresholds on driving safety are well understood. Therefore, in the case of alcohol it is possible to combine experimental and epidemiologic data and to determine the relation between behavioural impairment and accident risk.

Since there is so much relevant literature about the effects of those substances (especially of alcohol) on human performance and driving behaviour, meta-analyses are conducted to combine the results of the experimental studies for the different substances. The aim is to establish a quantitative estimation of the effects on driving-related parameters (e.g. attention, reaction time). The outcomes of the meta-analyses serve as an input for Task 1.3 of DRUID: to give recommendations of concentration thresholds at which performance is impaired for psychoactive substances.

Deliverable 1.1.2 consists of three parts each dealing with different substance classes. The present part (D 1.1.2a) refers to the results of experimental alcohol studies. The report is based on the publication of Krüger, Kohnen, Diehl & Hüppe (1990), who reviewed the literature on the effects of low dosages of alcohol. However, the present focus of interest does not only lie on small concentrations of alcohol. The intention was to consider all experimental studies concerning the effects of alcohol on human behaviour and on subjective parameters like drowsiness, and to look more deeply at the performance tasks and their specifications. Furthermore, the material gathered for the meta-analysis was used to survey the methodological state of the art of alcohol research in order to draw conclusions for future investigations.

2 LITERATURE SELECTION

To conduct the meta-analysis all available publications that empirically answer the question of the influence of alcohol on (driving) performance and mood had to be collected. The enormous quantity of publications on alcohol and its effects demanded the definition of selection criteria for accepting or rejecting a paper from the literature pool. In this report “literature pool” means all papers which were collected as relevant or possibly relevant to the topic.

2.1 Selection criteria

The following presented inclusion and exclusion criteria were not applied just once. The stages of literature selection, acquisition and processing demanded a repeated checking of each paper for the postulated criteria.

2.1.1 Exclusion criteria

If a study met one or more of the following criteria, it was excluded from further consideration:

(1) The study is set up *non-experimentally*.

This means, only experimental laboratory or field studies remained as material. Analyses of accident statistics or epidemiological investigations were not considered. The effect of alcohol in these studies is not controlled for other influencing factors (e.g. fatigue).

(2) The study investigates only variables which are not connected to behavioural abilities needed to drive a vehicle safely.

This excluded papers which are mainly concerned with *physiological effects* of alcohol (e.g. cardiovascular functions or the functions of other organs) or metabolic processes.

(3) *Only animals* serve as subjects, not humans.

The results of animal tests were not considered, as the transferability to humans is doubtful, especially regarding behavioural variables, which are the main topic of the analysis.

(4) Alcohol is administered by *intravenous infusion*.

Only studies with oral alcohol administration were considered for the meta-analysis for reasons of comparability (e.g. absorption times are different) and for reasons of common practice (an oral intake is more usual).

(5) Less than *6 subjects* participated in the study.

For methodological issues, a minimum of 6 subjects was required since the power of the statistical tests is likely to be diminished with smaller samples.

(6) The investigated population is composed solely of *alcoholics*.

The classification of an investigated group as alcoholics was adopted by the authors of the publication. Because of unequal alcohol tolerance and different metabolism processes in alcoholics and non-alcoholics, it must be assumed that study results obtained with an extreme group are of limited significance for the driving safety of the general population.

2.1.2 Inclusion criteria

The following inclusion criteria were set for a study to be accepted for further processing:

(1) The study must use a *control group design*.

The effects of alcohol have to be tested by comparing the alcohol group with a placebo or non-alcohol condition. This ensures that no other influencing factor (e.g. testing time, test situation) is responsible for the observed result.

(2) At least one *alcohol-only treatment* must be applied.

This refers especially to studies whose primary interest is the investigation of drugs. To be included into the literature pool, not only the effect-modifying capacity of alcohol (i.e. alcohol-drug interaction) should be investigated, but also the pure effect of alcohol.

(3) *Own experimental data* have to be reported.

The minimal demands of a scientific report must be met, in particular referring to the data of the application of alcohol. Therefore, this meta-analysis relies only on studies which generated their own experimental data. If the same study was published more than once by an author or group of authors, it was included in the literature pool only once, namely in its most comprehensive version.

(4) *BAC must be reported* or be calculable from reported data.

If the empirical BAC was not measured or reported, its calculation with the Widmark formula must be possible. This needs information of the consumed quantity of alcohol and of the time between the end of alcohol intake and the beginning of measurement of the investigated variables. It was required that the alcohol dosage in grams of pure alcohol per kilogram of body weight was computable from the data given in the publication. Alcohol quantity was frequently already reported in g/kg in published work. The information of the volume of liquid sufficed if the alcohol concentration of the drink was also reported. In addition, the time after drinking, when measurement began, had to be reported or be calculable from other time information given in the description of the experiment.

(5) The study must be published in or after *1990*.

The review of literature on alcohol effects of Krüger et al. (1990) includes studies up to 1989 and these were integrated in the present analysis.

2.2 Literature search

2.2.1 Overview

The literature search was initiated to find as many studies as possible in the scientific literature, which reported experimentally determined results concerning the effects of different blood- or breath-alcohol concentrations (hereinafter summarised as BAC, because empirical breath concentrations were transformed into blood alcohol equivalents by the authors).

It soon became apparent that the effects of alcohol have been investigated in an enormous number of papers which are scattered widely over different research fields. Therefore, to fulfil the objective of the project without exceeding time and cost constraints, specialised search strategies were used (see next chapter). They were applied on different levels:

(1) Computer searches in relevant databases (Medline, PsychInfo).

(2) Tables of content and abstracts of relevant scientific journals.

(3) The publications of authors, of whom more than one study was included into the literature pool.

(4) Reference lists of the processed literature, reviews and non-experimental publications.

Even if the complete pool of publications on the subject of "effects of alcohol on (driving) performance, social behaviour and mood" could presumably not be acquired, one may assume that the present literature material comprises a representative and comprehensive overview of the available empirical work on the subject. The deadline to be included into this meta-analysis was November 2007.

2.2.2 Sources of literature

2.2.2.1 Bibliographical databases

The computer search was restricted to two databases, which were best suited to the object of investigation. To perform search runs, the databases Medline and PsychInfo were chosen. These bibliographic systems comprise a multitude of medical and psychological periodicals, in which the majority of the studies analysing the effects of alcohol is contained.

For both databases, the search took place in June 2005 and once again in November 2007, and it was run with the limitation that the publication year is ≥ 1990.

(1) Medline: The search for studies with "alcohol" in the so-called MESH field (major and minor descriptors) offered more than 33,000 publications since 1990. Therefore, the search was carried out with the combination "alcohol and performance" in MESH with respect to the main focus of the meta-analysis. With this strategy, a narrowed number of 290 publications appeared.

(2) PsychInfo: In this database, the search for studies with "alcohol" in the so-called DE field (major and minor descriptors) resulted in more than 15,000 publications. To reduce the number, the search was then performed with the combination "alcohol" in DE and "23" as classification code (CC) for "human experimental psychology". Thereby, 114 publications remained for analysing.

This rather strict search strategy was completed by three further levels of searching.

2.2.2.2 Relevant scientific journals

The tables of content and abstracts of 20 relevant periodicals (whose titles contain e.g. the words “alcohol”, “substance” or “addiction”) were analysed. The journals were all available via the databases Medline, PsychInfo or Psyndex. Search runs were performed with the name of the journal in SO (source) combined with “alcohol” in TI (title). All in all, 6,644 publications were found, of which 131 met the inclusion criteria and were not already included in the literature pool.

2.2.2.3 Papers of relevant authors

The search was supplemented by analysing the publications of experimental alcohol experts, this means of authors with more than one paper in the literature pool. This was the case for 106 authors. Each search was run with the author’s name in AU (author) linked with “alcohol” in TI (title) in Medline and PsychInfo together. A total of 1,542 papers were provided for reviewing. After applying the in- and exclusion criteria, 89 papers which were not already included in the literature pool remained for the meta-analysis.

2.2.2.4 Reviews and bibliographical references

Another 172 studies were identified as presumably relevant for the topic by checking the bibliographical references of the collected papers (including 14 reviews). After looking at approximately 4,000 references of more recent papers, it became obvious that almost every suitable publication had already entered the literature pool. This can be seen as an indicator for an exhaustive search strategy.

2.2.2.5 Unspecific search

Moreover, 12 papers were added to the literature pool without any specific search, this means they were already at hand.

2.3 Results of the literature search

The described search strategies led to an individual examination with respect to the above defined criteria of more than 12,000 bibliographical references. A first checking of the titles resulted in 808 publications possibly relevant to the topic. After reapplying the in- and exclusion criteria when reading the abstracts, 438 studies qualified for remaining in the literature pool. Of these, 24 papers were not available, this means they could not be found at university libraries in Germany or it would have been too expensive to obtain them. The copies of the remaining 400 papers were assembled as well as the copies of the 14 reviews. While processing the literature by reading the whole texts, the selection criteria were applied again and 79 publications were sorted out. Thus, 321 papers are left as database. These papers report on 329 experiments with a total of 4,078 findings of alcohol effects on (driving) performance, social behaviour or mood. Figure 1 summarises the output of the literature search.

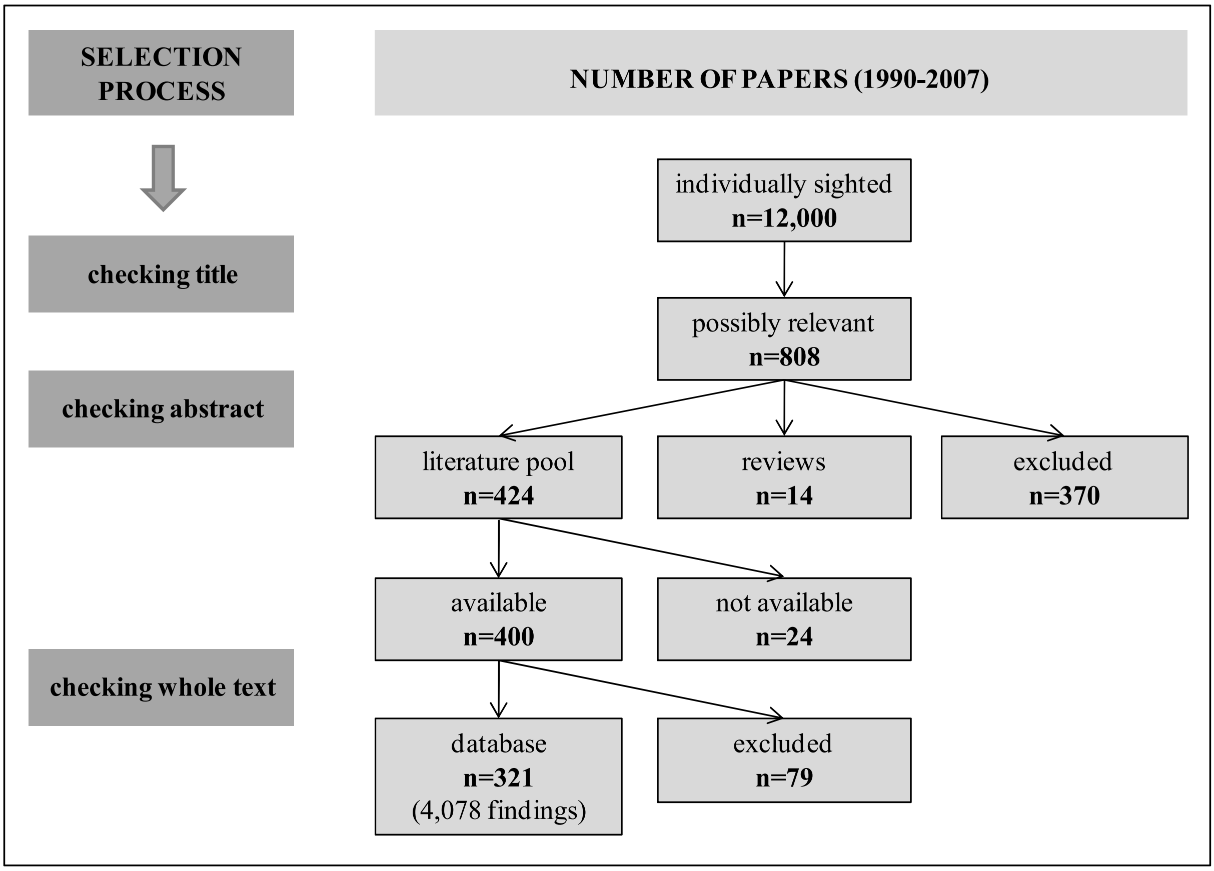


Figure 1: Results of the literature search and evaluation of the relevant papers.

Moreover, the references of the former meta-analysis of Krüger et al. (1990) were reviewed. Of these 202 studies, which investigated the effects of alcohol before 1990, 8 were not available and 11 were excluded because of methodological issues. Apart from this, 54 studies were not reviewed, because the findings only concerned subjective or physiological effects and no performance effects, which were primarily of interest to broaden the literature material. Thus, 129 studies from the years 1950 to 1990 were added, in which 142 experiments with 1,222 findings were described.

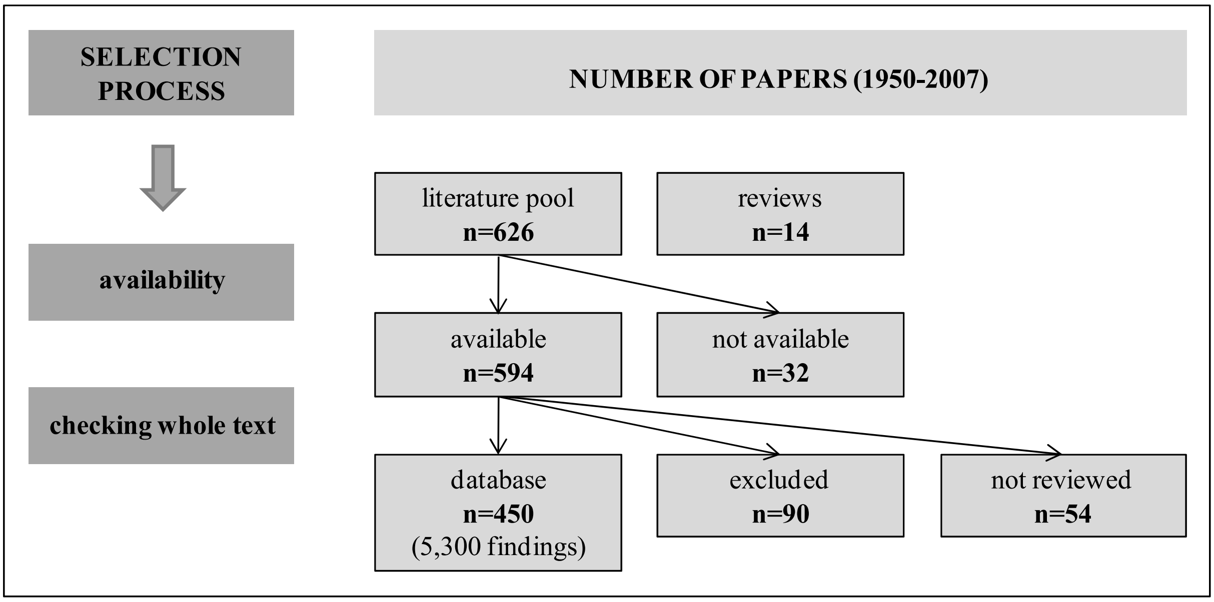


Figure 2: Overall result of the literature search and the evaluation of the relevant papers, after adding studies from the former meta-analysis.

As Figure 2 shows, the total number of papers which seem to be suitable for the meta-analysis is 626. Of the 594 available studies, 90 were excluded for different reasons after checking the whole text and 54 of the former meta-analysis were not reviewed for reasons mentioned above. Finally, 450 papers remained to form the literature material for the meta-analysis. In them, 471 experiments are described with a total of 5,300 findings of alcohol effects on (driving) performance, social behaviour or mood.

3 PROCESSING OF THE RELEVANT LITERATURE – THE DATABASE

3.1 Basic structure of the database

For the data input Microsoft™ Access was used. The basic structure of the database consists of two levels. The higher level ("publication level") contains all information about the publication and the basic methodology of the study which in most cases corresponds to one experiment (including one study design, one sample, etc.). If a publication contains more than one experiment, every experiment is inserted in the database as a separate publication. Each publication consists of one or more research findings. In this lower level ("finding level") all relevant information about the single findings is stored, which is for example the BAC level and the outcome for every examined parameter (significant increase or decrease or no significant change). The exact contents of the extracted information are described below[1].

3.1.1 The publications

The principle information describing a publication consists of the following topics which correspond to different entry forms in the database:

- the reference including information about the source (author, publication year, title, journal, volume, number of volume, pages, document type, etc., see Figure 3),
- the abstract,
- a **comment** on any unusual aspects of the study as well as a classification of the main question (e.g. "alcohol and drugs"),
- information about the **sample** (e.g. number and gender of the subjects),
- information about the **methodology** (e.g. the study design, single or double blind studies),
- **statistical** information of the study (e.g. kind of control group),
- information about the **processing** (e.g. date of processing, reasons for disqualification of the study).

[1] In the text only the basic structure of the database is explained. For a detailed description of all fields, categorisations and rules for the classifications see Chapter 8.1 in the appendix.

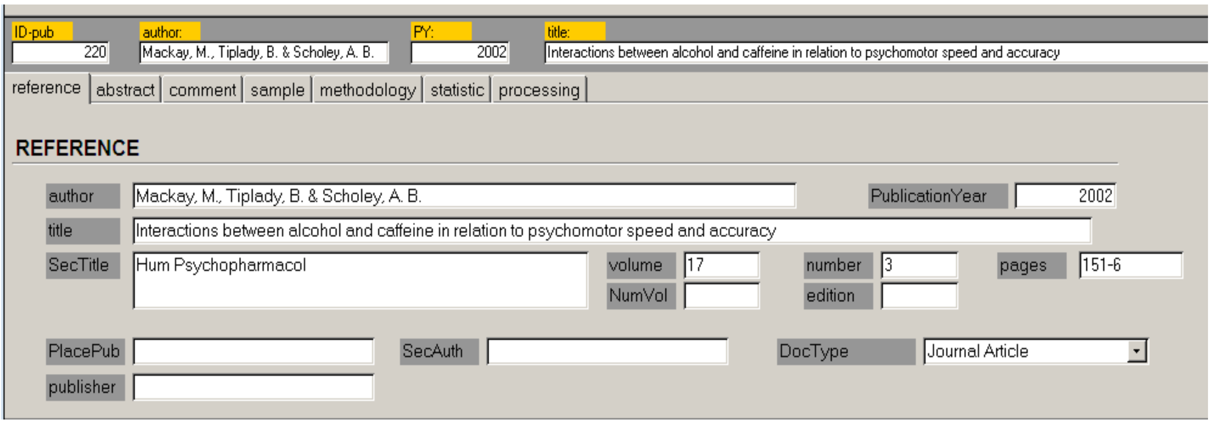


Figure 3: Screenshot of the input fields on the publication level.

3.1.2 The findings

The information describing a finding consists of the following topics corresponding to different entry masks in the database:

- information about the **BAC** (dose, BAC level, drinking time, etc., see Figure 4),
- information about the **task**, with which the parameter was measured,
- information about the **parameter** itself and the **result**,
- information about **other factors** and their interaction with the effect of alcohol (e.g. gender, other substances).

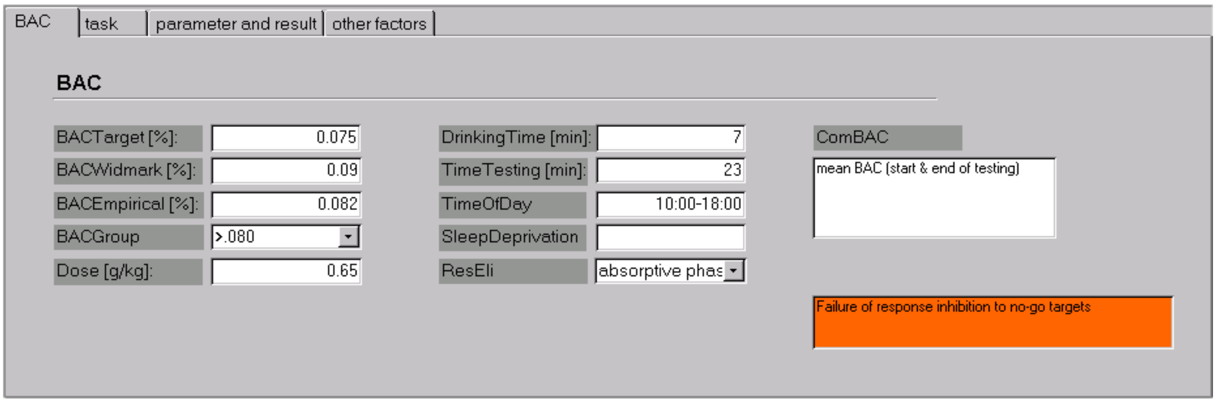


Figure 4: Screenshot of the input fields on the finding level.

Typically, the number of reported findings (i.e. the number of significant increase/decrease or non-significant results) corresponds to the number of tested BAC levels (without placebo) multiplied with the number of dependent variables (= parameters). So if only one dependent variable is tested in one alcohol condition versus placebo, there will be one entry in the database. If there are 8 dependent variables which are tested at three different BAC levels against placebo, there will be 8*3 = 24 entries in the database (see Figure 5). Different BAC levels might result either from different alcohol dosages for the subjects or from different points in time at which the same parameter is measured.

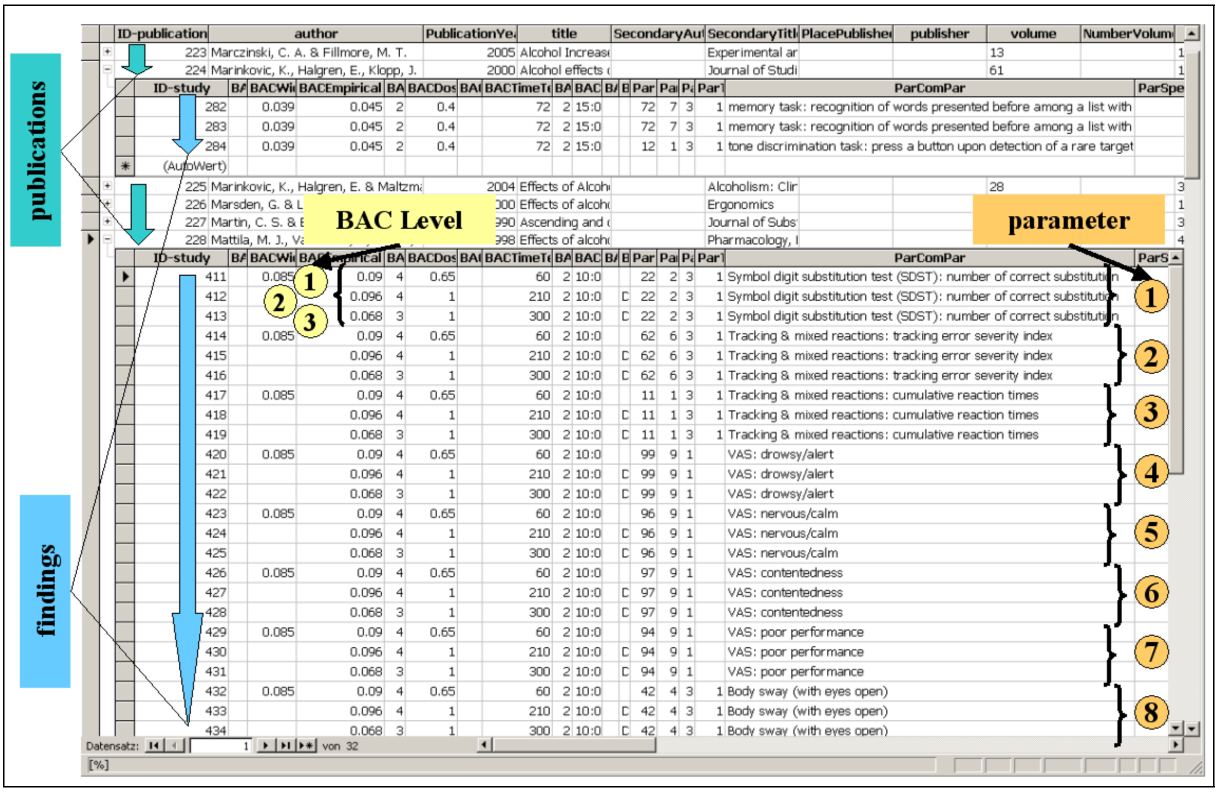


Figure 5: Structure of publications and findings in the database.

However, this rule needs not to fit all the time, for example, if there are multiple BAC levels but no post hoc tests. In this case, either the highest BAC is considered (if there is an effect) or the lowest (if there is no effect) in order to be conservative.

3.2 Description of the BAC

The main objective of the present report is to determine the effects of the different BACs on the indicators for traffic safety. In order to attribute the effects of alcohol to the respective BAC level, different ways of calculating the valid BAC must be introduced. For the determination of the BAC, different periods of time must be considered, namely the “drinking time”, the “time before testing”, and the “task duration” (see Figure 6).

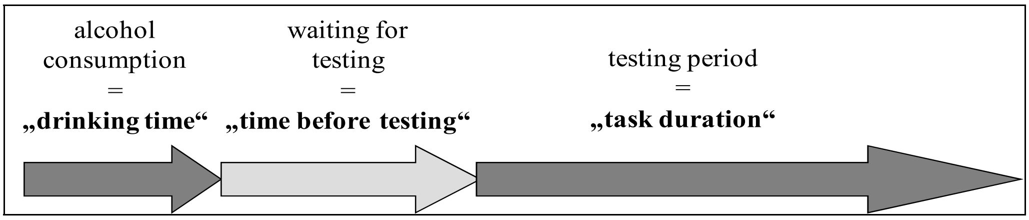


Figure 6: Illustration of the main chronological terms for calculating the BAC level.

In most publications these pieces of temporal information are given. However, sometimes there is a range given for the time periods, for example 10-20 minutes for drinking time. In this case the mean value is taken for further calculations.

3.2.1 Definition of the absorptive vs. eliminative phase

Due to the acute tolerance effect (Mellanby effect), meaning that there is greater impairment in the ascending than in the descending phase of the BAC curve (e.g. Hiltunen, 1997), these two phases have to be coded for further analysis.

If in the studies the BAC is measured empirically (by technical devices) before and after the test period and the empirical BAC after the test period is lower than before, an eliminative phase is coded. Conversely an absorptive phase is coded, if the empirically measured BAC after the test period is higher than before. If there are no BAC measurements, the criterion for differentiating between the two phases is set at 60 minutes after the end of alcohol intake, since the duration of the absorption phase is approximately between 30 and 90 minutes. The range might even be between a few minutes and two hours (Madea & Dettmeyer, 2007) and depends, for example, on the alcohol dosage, the drinking time or the content of the stomach. Getting only a low alcohol dose or drinking on an empty stomach leads to an earlier BAC peak. Therefore, it is assumable that the effects classified as "eliminative" do in fact lie with high probability in the elimination phase, while a part of the effects labelled as "absorptive" is probably eliminative.

If the duration of the task is given, this variable has to be considered as well for the coding of the two phases. Test periods which take place mainly within the first 60 minutes after the end of alcohol intake were classified as absorptive. If the main part of the task takes place after 60 minutes have passed since the end of alcohol intake, it is classified as eliminative. This means that to determine the crucial time phase, one half of the task duration is added to the time between consumption and start of the test [(task duration/2 + time before testing) < > 60 min][2].

3.2.2 BAC calculation by using the empirically measured BAC

In some studies the BAC is measured and reported at testing times, so that the empirical value can be taken. But there are lots of cases in which it is more complicated:

(1) The BAC before and after testing is given (especially if the task takes a long time):
⇨ the mean value is taken.

(2) Only the BAC before or after testing is given and the task takes more than 30 minutes:
⇨ the mean value during the task is calculated by estimating the alcohol concentration before or after the test, respectively, via the elimination function (elimination of 0.015% alcohol per hour is assumed, see Chapter 3.2.3). This calculation of course is only possible in the eliminative phase. In the absorptive phase there is no other possibility than taking the given value.

(3) The BAC is reported at a given time, but the test (or another test) takes place earlier or later:
⇨ the value is estimated via the elimination function as described above.

(4) More than one BAC is reported at given times, and the test takes place in-between:
⇨ the value is estimated via linear interpolation.

3.2.3 BAC calculation by using the Widmark formula

In some studies the BAC is not measured or reported. In order not to have to exclude these studies, the BAC is calculated via the Widmark formula (Widmark, 1932). It was used in the following modified form (Krüger et al., 1990):

$$\boxed{\mathit{BAC(g/100ml)} = \frac{\mathit{alcohol\ quantity\ g/kg}}{\mathit{10 * reduction\ \ factor}} - \mathit{alcohol\ elimination}}$$

[2] Example: time before testing = 10 min, task duration = 60 min ⇨ 60 min / 2 + 10 min = 40 ⇨ 40 min < 60 min ⇨ absorptive phase

The reduction factor in the Widmark formula (or distribution factor) represents the ratio of total body alcohol and blood alcohol concentration. Due to the close relationship between the alcohol content and the water content of organs, tissues and body fluids, r also corresponds to the ratio of total body water and blood water (Seidl, Jensen & Alt, 2000). In the forensic practice the usage of a reduction factor of 0.7 for men and 0.6 for women has become established (Huckenbeck & Bonte, 2003). If the study sample contains both sexes, a mean value of 0.65 is used.[3]

The calculated BAC by the first part of the formula must be seen as a virtual BAC maximum at the beginning of alcohol intake. From this maximum a time-dependent elimination is subtracted. The elimination of alcohol starts immediately after the intake. This elimination rate is estimated – conservatively – at 0.015 g/100 ml per hour (Madea & Dettmeyer, 2007).

The Widmark formula does not account for the so-called absorption deficit, which describes the absorption conditions of alcohol dependent on the physiological state of the body and on the fluid content of the drink. For example, the deficit is higher (i.e. the alcohol is absorbed more slowly) with a full stomach than with an empty one and higher for beer than for spirits, assuming the same quantity of alcohol (Kalant, 1971). The majority of the present papers does not give sufficient information to estimate this absorption deficit reliably.

Thus, the calculation of the BAC results in slightly exaggerated estimations compared to the empirically measured BAC. The consequences of this overestimation are conservative: alcohol-related decrements are demonstrated for comparatively higher BACs. "Conservative" is here seen from the statistical point of view, under which the null hypothesis must be protected as long as possible from being rejected.

For reasons of comparisons with the empirical BAC, two Widmark BACs are calculated before and after the test and the mean value is taken, if the test takes more than 30 minutes.

3.2.4 Calculation of the administered quantity of alcohol

Another difficulty in assembling alcohol studies is the fact that the administered alcohol dosages are not uniformly documented in the literature. The existing variants are:

[3] Methods determining the distribution factor more precisely by adjusting for age, weight or height (see e.g. Seidl et al., 2000), which improves the BAC estimation, cannot be used, because the studies rarely provide the subjects' height or weight.

- g/kg (pure alcohol per kilogram body weight),
- ml/kg (pure alcohol per kilogram body weight),
- ml/kg of a standard alcoholic beverage with indication of the alcohol level (e.g. 40% or 80-proof vodka),
- ml or ccm (1 ml = 1 ccm) not referring to kg,
- country-specific units of quantity (e.g. ounces [oz]).

In this report, the quantity of the consumed alcohol is expressed in grams of alcohol per kilogram of body weight, which is the internationally common unit. All quantities that were not expressed in g/kg had to be converted. The procedure in the cases of the above variants was as follows:

1. Quantity given in ml/kg (pure alcohol)

The given quantity of alcohol is converted into g/kg using the specific weight of alcohol (0.79 g/ml).

Example:

Quantity of alcohol administered: 0.7 ml/kg

Conversion: 0.7 ml/kg * 0.79 g/ml = 0.55 g/kg

2. Quantity given in ml/kg (standard alcoholic beverage)

The given quantity of alcohol is converted into g/kg using the specific weight of alcohol (0.79 g/ml) as well as the percentage by volume of the beverage. If the alcohol level is indicated by "proof", it has to be converted into % by dividing it with 2.

Example:

Quantity of alcohol administered: 0.7 ml/kg

Alcohol level of the beverage: 40% (or 80-proof spirit)

Conversion: 0.7 ml/kg * 0.79 g/ml * 0.4 = 0.22 g/kg

3. Total quantity of the consumed alcohol is given

In few studies, the administered alcohol quantity is given as a whole, not referring to kilogram of body weight. The quantity of alcohol is converted using the reported average body weight of the subjects or (if not reported) an average weight of 70 kg for men and 60 kg for women.

4. Quantity given in ounces [oz]

The quantity of alcohol given in the unit ounce is converted into ml by multiplying it with 28.41 (British) or with 29.57 (American), respectively. Afterwards, it is converted into g/kg as described above.

Sometimes different dosages for men and women are used. In such a case, the average of the dosages was taken.

3.3 Classification of the tasks and parameters

A crucial point of every meta-analysis is the classification system within which the single studies are to be arranged. For evaluating substance effects, two different classification systems are established which shall complement one another:

The first one (introduced by Krüger et al. in 1990) is based on functional behavioural categories relevant for traffic safety like “attention”, “visual functions” or “subjective intoxication”. The assignment of a study result to one of these driving-relevant categories depends on the investigated psychological function of the task.

The second one, which will be introduced in this report in Chapter 3.3.2, concentrates only on performance tasks. It is based on the model of information processing (Wickens, 1984) and on several dimensions describing the characteristics of a task which might determine a good or bad performance under psychoactive substances (e.g. the motor complexity of the task).

3.3.1 The function-oriented classification system

Based on rather rough classifications by Moskowitz & Robinson (1987), Brückner, Peters & Sömen (1988) and Staak, Hobi & Berghaus (1988), Krüger et al. (1990) have developed this classification system for the meta-analysis of experimental alcohol studies. It was also used by Berghaus (1997) for classifying the effects of different medicines and by Berghaus, Schulz & Szegedi (1998) for classifying the effects of cannabis.

Within this method, the different performance tasks used in the studies are classified into one of the driving-relevant performance main categories (for an example see Figure 7). Each of them consists of several subcategories describing the paradigm more precisely, into which the tasks are classified as well. Besides the performance aspect, the domains of mood (containing subjective feelings like intoxication or tiredness) and social behaviour are integrated into the analysis. Due to the extensive subdivision, it is quite simple to assign the different findings of a study to the different main and subcategories.

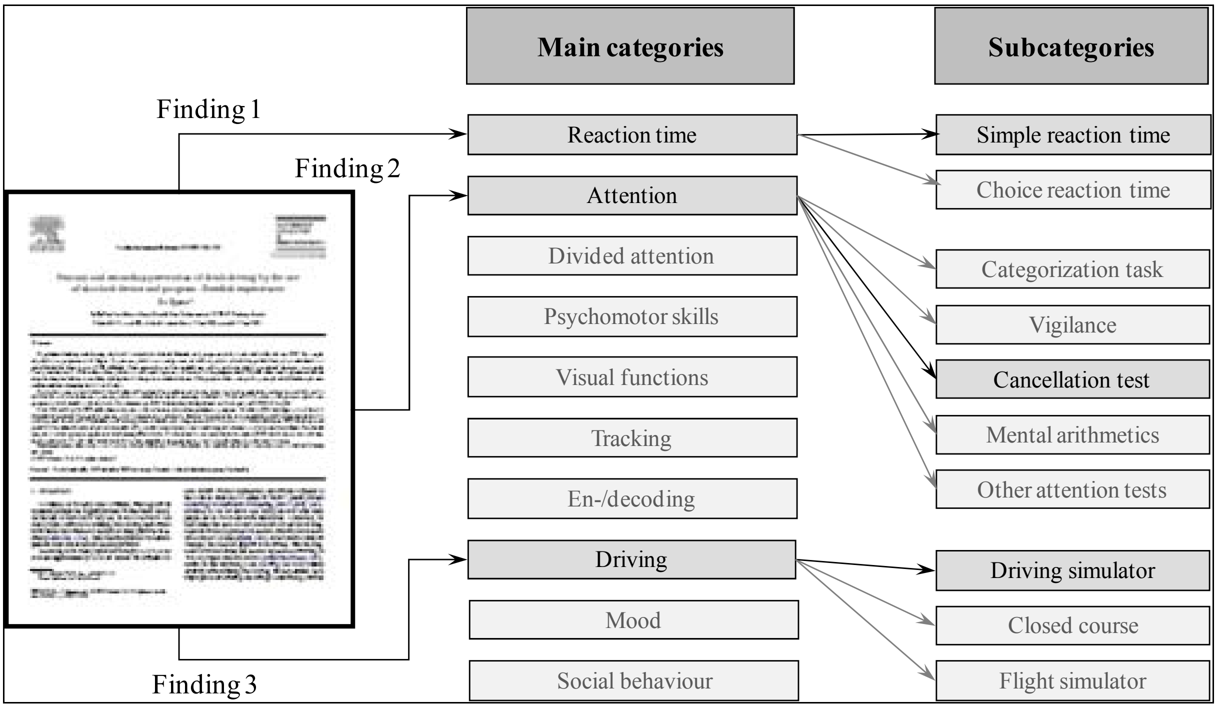


Figure 7: Example of the classification of findings into main and subcategories following the function-oriented classification system.

Using this approach the categories are not confounded, because all findings are classified only once into one category. In doing so the problem may arise that some of the subcategories will show small frequencies, so that in these cases only rough evaluations on the main category level are advisable. In advance of the results reported in 5.1, the frequencies of findings per category are presented in Table 1 together with the taxonomy and examples of tasks.

Table 1: Function-oriented classification of parameters and frequencies of findings.

A. PERFORMANCE CATEGORIES			
Main & subcategory	**Examples of tasks**	**N**	**%**
1) Reaction time		373	11.5
- Simple reaction time	- Visual/auditory stimuli: press a button as quickly as possible	183	5.6
- Choice reaction time	- Diverse visual or auditory stimuli: respond only to the target stimulus or with different keys to correspondent stimuli	190	5.8
2) Attention		692	21.2
- Categorisation task	- Card sorting tasks; DSST; trail making test	202	6.2
- Vigilance	- Respond to rare target stimuli (Mackworth)	78	2.4
- Cancellation test	- Cross out target letters among distractors (D2)	44	1.4
- Mental arithmetics	- Pauli test (addition); Serial seven (subtraction)	47	1.4
- Other attention tests	- Go/NoGo tasks; Stroop test; logical reasoning	321	9.9

3) Divided attention		365	11.2
- Reactions to 2 stimuli	- Reaction to central & peripheral stimuli; auditory 2-channel signal detection task	182	5.6
- Reactions to 2 tasks	- Tracking or cancellation test & visual or auditory stimuli; many tasks simultaneously	183	5.6
4) Psychomotor skills		339	10.4
- Hand-eye-coordination	- Circular lights; hand steadiness; pin test	163	5.0
- Posture	- Standing steadiness (Romberg or balance test)	132	4.1
- Other motor functions	- Tapping test; tremor; proprioceptive coordination	44	1.4
5) Visual functions[4]		475	14.6
- Physiology of the eye	- Visual acuity; critical flicker fusion frequency	181	5.6
- Eye movements	- Visual tracking; nystagmus	164	5.0
- Binocular vision	- Heterophoria; stereopsis; exophoria	65	2.0
- Complex perceptual functions	- Spatial orientation; time or length estimation	65	2.0
6) Tracking		237	7.3
- Easy compensatory tracking	- Horizontal deviations have to be regulated with a steering wheel	33	1.0
- Difficult compensatory tracking	- Critical tracking: unstable system for which deviations between target & actual position have to be compensated	27	0.8
- Easy pursuit tracking	- Pursuit rotor: pursuit of a moving light; spiral maze	158	4.9
- Difficult pursuit tracking	- Stressalyzer (Tracometer): catch a target with a steering wheel	19	0.6
7) En-/Decoding		455	14.0
- Information processing	- Cognitive speed: recognition of a tachistoscopically presented stimulus (letters or pictures)	170	5.2
- Memory	- Free recall, cued recall or recognition tasks	285	8.8
8) Driving		323	9.9
- Driving simulator	- Road tracking, car follow, hazard detection and reaction task	212	6.5
- Closed course	- Road tracking, car follow, hazard detection and reaction task	65	2.0
- Flight simulator	- Routine scenarios, communication, approaches	46	1.4
Total number		**3259**[5]	**100**
B. MOOD CATEGORIES			
Main & subcategory	**Examples**	**N**	**%**
9) Mood		1953	97.3
- Experienced intoxication	- Feelings of drunkenness	394	20.2
- Unpleasant physical sensations	- Dizziness, nausea	236	12.1
- General well-being	- Global mood	12	0.6
- Subjective rating of performance	- Feelings of performance	87	4.5
- Physiological measurements	- Pulse, temperature, blood pressure	77	3.9
- Arousal/activity	- Stimulation, sedation, relaxation	365	18.7
- Pleasure	- Contentment, effect liking, depression	434	22.2
- Dominance	- Social mood, friendliness	38	2.0
- Tiredness	- Fatigue, drowsiness	202	10.3
- Aggressive feelings	- Subjective: hostility, anger	53	2.7
C. SOCIAL BEHAVIOUR CATEGORIES			
Main & subcategory	**Examples**	**N**	**%**
10) Aggressive reactions		50	2.5
- Aggressive behaviour	- Objective: hostility	50	2.5
11) Social behaviour		5	0.3
- Behavioural measures of social activities	- Objective: social interactions	4	0.2
- Social feelings	- Subjective: social anxiety	1	0.1
Total number		**2008**	**100**

[4] Some findings of this category were not used as "performance findings", because they are physiological ones.
[5] The exact number of "performance findings" after subtracting the physiological findings is 2983.

In total, there are 5267 findings of effects which can be assigned to the performance or mood or social behaviour categories. The remaining 33 findings which were entered into the database cannot be specified.

Among all findings mood variables occur most frequently, followed by attention, visual functions and en-/decoding variables, as it is visualised in Figure 8. Driving behaviour, tracking and variables in the social behaviour categories are relatively little investigated. These differences in frequencies are not surprising when considering the experimental designs: attention or visual functions tests are easy to conduct and it is easy to determine several parameters (each representing a finding in the meta-analysis) as it is the case with mood variables. In contrast, tracking and driving tests are more complex to conduct and especially in tracking tests usually only few parameters like errors or horizontal deviation are determined.

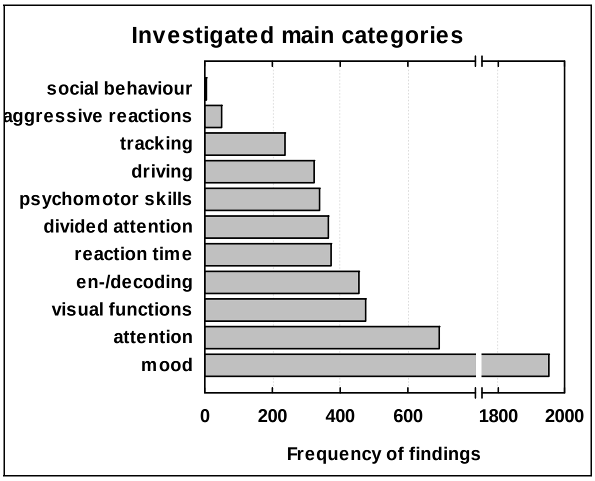


Figure 8: Frequency of findings per main category.

Additionally, it becomes obvious that the frequencies of findings in the different subcategories are extremely unequal (Figure 9). Some subcategories are hardly investigated, so that a meta-analytical evaluation of them will not make any sense. For example frequencies of complex performance tasks like difficult tracking, closed course, flight simulator or vigilance tasks are low, whereas frequencies of less elaborated performance tasks like reaction or memory tasks are high.

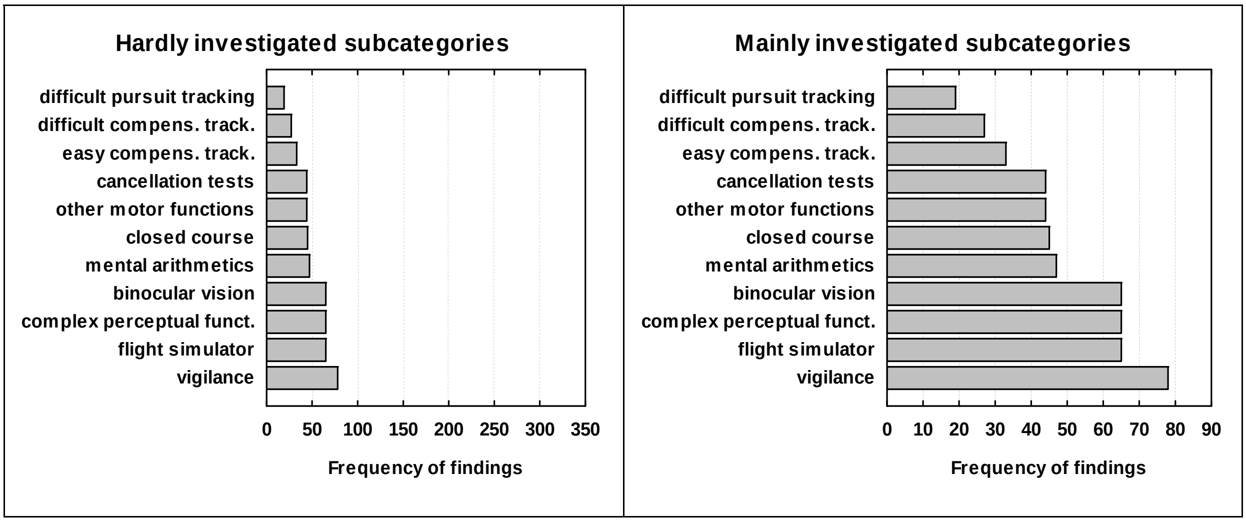


Figure 9: Frequency of findings per subcategory – hardly investigated (left) vs. mainly investigated (right).

3.3.2 The process-/task-oriented classification system

3.3.2.1 Basic principles of the classification

The function-oriented approach – as described in the chapter above – assigns the tasks to predominant psychological or psychophysiological functions. The same approach was chosen in different reviews about alcohol effects (see for example Moskowitz and Fiorentino, 2000).

However, modern cognitive psychology is interested more in **processes** than in static functions. In addition, as a consequence of the discussion about single or multiple resources in human performance, an in-depth analysis and classification of **tasks** and the respective resources become important. Therefore, to link this meta-analysis with the concepts currently under discussion, a new classification system is introduced. To establish this system, we first have to rely on a theoretically based process model of human performance. Most widely accepted is the model of information processing which exists in different variations. Here, we refer to the version developed by Wickens (1984). Moreover, a comprehensive classification system for tasks and resources has been lacking up to now. Therefore, we were forced to browse the literature for the most frequently used task characteristics.

3.3.2.2 The elements of the information processing model

Figure 10 shows the version of Wickens' model in which several main characteristics of this model become obvious. Firstly, the sequential nature of information processing is striking. After sensory processing and perception of the stimulus material, a response must be selected and executed. Perception and decision making are determined by the long-term or by the working memory. Secondly, attention is required at each stage after sensory processing. These attentional resources are limited and thereby must be shared between the different process components. Thirdly, there is a closed-loop feedback structure, monitoring the consequences of actions.

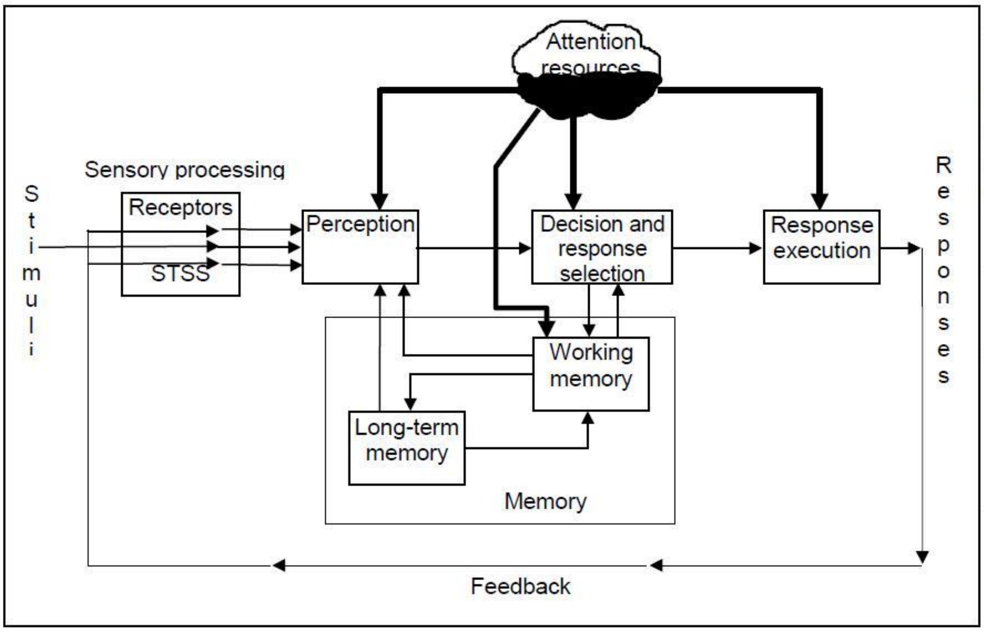


Figure 10: Model of the stages of human information processing (Wickens, 1984).

The model helps to classify tasks according to their information processing stage, allowing a more precise description of the tasks used in the alcohol studies. To distinguish adequately between the tasks and for an accurate classification, the stages have been subdivided more detailedly. From the model of Wickens (1984) the following process stages (=subdimensions) were derived (see Table 2):

Table 2: Derived stages of information processing from the model of Wickens (1984).

	Stages of information processing adapted for the process-/task-oriented classification system
1	Active search
2	Sensory perception
3	Feature extraction
4	Operation/processing
5	Decision
6	Reaction planning
7	Motor output

The subdimension *active search* is central for a task where the operator has to scan the environment adequately for relevant stimuli. These tasks are usually characterised by a high spatial uncertainty of the stimuli. Factors facilitating such tasks are environmental expectancies or features like the salience of stimuli. Eye movements or saccades are typical measures. In *sensory perception* tasks the main difficulty is the detection of the stimulus (usually only one) – not due to spatial uncertainty but due to a signal-noise-problem. The criterion is whether the stimulus is perceived or not. Consequently, thresholds should be taken as parameters. The next stage of information processing is called *feature extraction* according to Sanders (1983). At this stage an operator has to select the relevant information, for example the shape or colour of the stimuli. Figure-background-distinction or interference are corresponding concepts. The subdimension *operation/processing* is chosen if cognitive processes are essential, for example complex categorisations, estimations, memorisation or some kind of arithmetic or mental rotation. Tasks are classified into the subdimension *decision* if the operator has to decide between different alternatives each representing another strategy. Typical influencing factors are the uncertainty of the consequences, lack of expertise and time pressure. Risk behaviour, sensation seeking and response biases are frequent concepts. Whereas in the model of Wickens the decision stage only involves the selection of a response, here a more detailed subdivision is introduced. The first response stage is *reaction planning*. Planning needs to invoke one (reaction "yes" or "no") or more (which reaction?) motor patterns or schemes, this means well-learned sequences of actions. In contrast, the second response stage *motor output* describes the fine adjustment of the necessary motor execution.

The best way to determine which stage of processing should be assigned to a task is to have a look at the nature of erroneous reactions. Figure 11 exemplarily depicts the possible errors during the different stages of information processing using a multiple choice reaction time task.

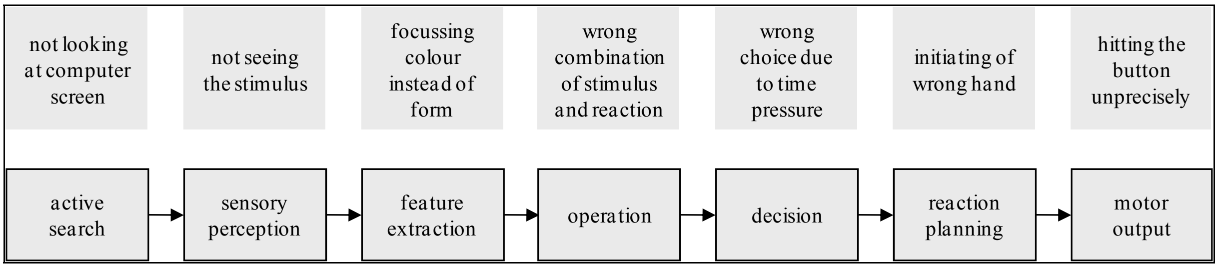


Figure 11: Possible errors during the different stages of information processing in a multiple choice reaction time task.

With Wickens' process model the first dimension of the new introduced classification system is specified. Experience during the classification procedure of the tasks used in alcohol studies showed that some tasks should be assigned to more than one process stage. Therefore, it was decided that up to two stages of information processing are allowed for classifying.

3.3.2.3 The dimensions of the task classification

Besides the model of information processing, the new classification approach refers to basic concepts in the classification of tasks and resources. In Table 3, the dimensions and subdimensions of the task classification are given together with the classification rules[6] (see also Chapter 8.1.2.2 in the appendix) and examples of tasks. The first two rows present the subdimensions of the process model.

[6] The classification is done based on the combined information of the task, the instruction and the parameter.

Table 3: Dimensions and subdimensions of the process-/task-oriented classification system.

Dimensions & subdimensions	Classification rules	Examples of tasks
1) Stages of inform. processing 1		
- Active search	- The operator has to scan the environment for relevant stimuli	- Hazard perception test
- Sensory perception	- The stimulus has to be perceived	- Mackworth Clock
- Feature extraction	- The operator has to select the relevant information e.g. shape or colour of the stimuli	- Choice reaction task (CRT), D2
- Operation/processing	- Cognitive processes are essential, e.g. complex categorisations, estimations	- Mental arithmetics, memory tasks
- Decision	- Operator decides between different alternatives (no correct or incorrect answer)	- Gap acceptance test, planning and strategy tasks
- Reaction planning	- One (reaction “yes” or “no”) or more (which reaction) motor patterns or schemes are invoked	- Simple reaction task (SRT)
- Motor output	- Fine adjustment of the necessary motor execution (acceleration, force of the movement)	- Tracking
2) Stages of inform. processing 2		
- Active search - Sensory perception - Feature extraction - Operation/processing - Decision - Reaction planning - Motor output	See above	See above
3) Type of attention		
- Alertness	- Very high short-term attention to one or few stimuli	- Digit symbol substitution test (DSST), Circular lights
- Sustained	- Long-term attention to a task with high stimuli frequency or with high workload	-Wisconsin card sorting test, D2, Compensatory tracking
- Vigilance	- Long-term attention to a task with low stimuli frequency	- Mackworth Clock
4) Task combination		
- Single – discrete	- One task with distinct stimuli	- SRT
- Single – continuous	- One task without single stimuli	- Driving, tracking
- Double – 2x discrete	- Dual task: both tasks are discrete	- Go/no go task & auditory discrimination
- Double – discrete & continuous	- Dual task: one task is discrete, the other is continuous	- Mental arithmetics & driving
- Double – 2x continuous	- Dual task: both tasks are continuous	- Flight simulator: course maintaining & communication
5) Task pace		
- Self paced	- The operator is free to shape the speed-accuracy trade-off	- D2, Trail making test, DSST
- Task paced	- The stimuli appear in a fixed rhythm, time for performance cannot be influenced	- Mackworth Clock
6) Kind of stress	Depends on the instruction:	
- Speed	- “Operate as fast as possible”	
- Accuracy	- “Operate as accurately as possible”	
- Speed & accuracy	- “Operate as fast & accurately as possible”	
7) Stress level	Bases on an expert rating	
- Low	- Task with low stress intensity for the operator	- SRT
- Medium	- Task with more information to process	- CRT
- High	- Task with different information to process, very complex task or with time pressure	- Divided attention tasks
8) Sensory modality		
- Visual/spatial	- Task with visual stimuli	- Visual reaction task
- Auditory	- Task with auditory stimuli	- Tone discrimination
- Haptic	- Task with haptic stimuli	- Omitted tactile stimulus task
- Vestibular	- Task without stimuli, but effects on the vestibular system are of interest	- Balance test

Dimensions & subdimensions	**Classification rules**	**Examples of tasks**
9) Type of information		
- Formal/abstract	- Physical appearance of the stimuli (form or colour) is of importance	- SRT, CRT
- Semantic	- Interpretation or meaning of the symbol is of importance	- Mental arithmetics, even & odd digits, word encoding
10) Sensory dynamics		
- Static	- The stimuli are discrete and appear successively or the situation can be perceived at once	- SRT, CRT
- Dynamic	- The stimulus is moving or the relevant information is changing continuously	- Driving, tracking
11) Operation level		
- Skill-based	- Automatic processing, another task can be operated at the same time, performance will not improve significantly with training	- SRT, road tracking
- Rule-based	- Controlled processing, another task can be operated at the same time only with serious problems, performance improves with training	- CRT, D2, DSST, memory tasks, mental arithmetics
- Knowledge-based	- Very high conscious control, effortful, slow	- Problem solving, logical reasoning, strategy tasks
12) Memory		
- No memory	- Hardly any memory is required, memory is not the dependent variable	- All performance tests but memory tests
- Short-term memory (STM)	- Recall within 60 seconds	- Immediate memory tasks
- Long-term memory (LTM)	- Recall after more than 60 seconds	- Delayed memory tasks
13) Memory recall		
- No memory	- Hardly any memory is required, memory is not the dependent variable	- All performance tests but memory tests
- Recognition	- Comparison between memorised and presented stimuli	- Word, picture or number recognition, Sternberg test
- Cued recall	- Reproduction of the former learned stimuli is facilitated by cues	- Wechsler's paired associate test, word stem completion
- Free recall	- Reproduction of the former learned stimuli without any help	- Word or number recall, Wechsler's logical memory test
14) Motor complexity		
- Simple	- No fine motor regulations, e.g. only one button	- SRT, driving on a straight lane
- Medium	- Several simple options or fine motor regulations are required	- CRT (4 buttons at least), driving (some curves & speed adaptations), tracking
- High	- Coordinative aspects of the reaction	- CRT with buttons and pedals, flight simulator

In the following, three of the above listed dimensions are described more in detail for a better understanding. The dimension "type of attention" distinguishes between three different kinds of attention which we defined in the following way: the subdimension *alertness* means a rather short-term attention for some minutes to one or few stimuli with a high frequency of occurrence. *Sustained* attention is classified when operating a task with high stimulus frequency or high workload for a longer period of time. In contrast, *vigilance* is classified for long lasting tasks with low stimuli frequency or low workload. The temporal duration of a task is essential, because most of the tasks can be performed well for a short time span even under the influence of psychoactive substances. Operators can allocate additional resources, which lead to increased effort in order to compensate the detrimental effects of the substance. This usually works only for a short period of time after which the performance decreases (Hockey 1997, Holding 1983).

Another dimension which might have considerable influence on performance is the “task pace" dimension. It describes whether the operator is free regarding the timing of the task or not. In a *self paced* task the operator is allowed to shape the speed-accuracy trade-off (SATO: faster/worse vs. slower/more precise). Persons under the influence of alcohol may become more risky and decide to operate faster at expense of errors. If the task is *task paced*, the operator does not have this option.

The “operation level” according to Rasmussen (1986) describes the depth of information processing and distinguishes skill-based, rule-based and knowledge-based behaviour. A task is classified as *skill-based*, if the required operations are highly automated and take place without conscious control, which means that usually another task can be operated at the same time without serious problems. For highly automated tasks, training will not improve performance significantly. A *rule-based* task requires consciously controlled processing, so that another task can be operated at the same time only with serious problems. Training will improve task performance significantly. *Knowledge-based* tasks require processing on a higher conceptual level. The operator is confronted with an unfamiliar situation, for which no standard rules are available, so that processing is effortful and slow.

3.3.2.4 Classification procedure and resulting frequencies

When classifying a task, the stages of information processing are the focal point, whereas the other task-describing dimensions are the surrounding factors. Two performance tasks with the same name might be classified differently on some of these dimensions depending on the exact requirements in the tasks. Figure 12 gives an example of two possible classifications of a choice reaction time task on the dimensions described above depending on the task characteristics.

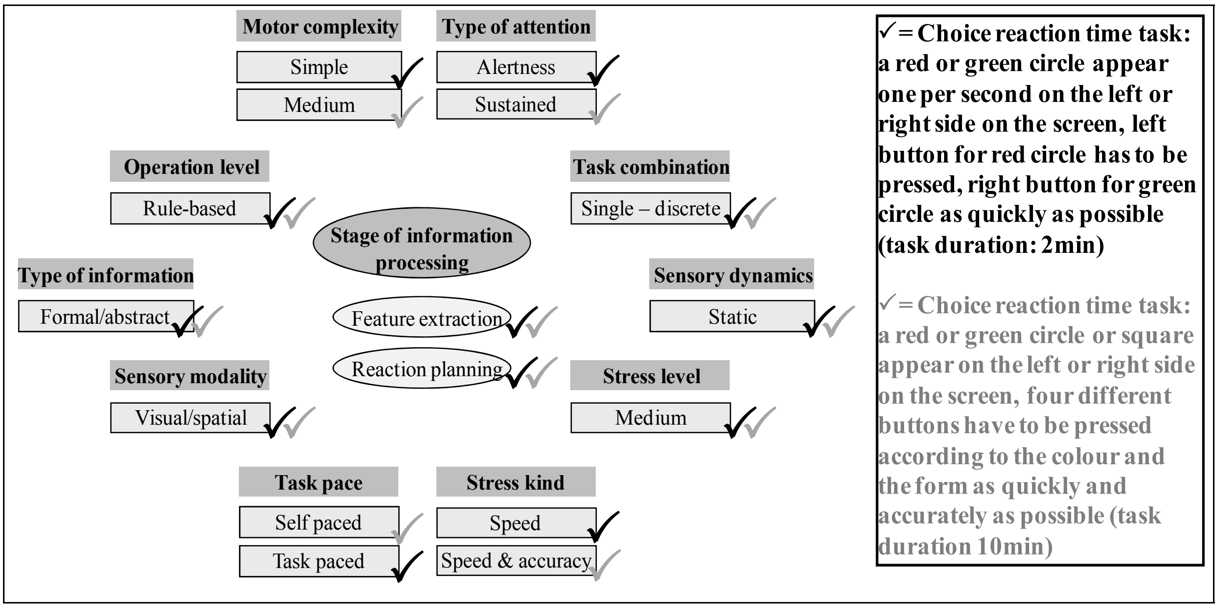


Figure 12: Example for the classification of a choice reaction time task with different characteristics.[7]

The frequencies of performance findings which have been classified in the dimensions above are listed in Table 4 as well as the distribution of findings within the dimensions. The number of findings per dimension varies between 2061 and 2967. The distribution of findings regarding the subdimensions is sometimes quite unequal. Some subdimensions are hardly investigated, for example tasks where *active search* or *decision* is classified as the relevant stage of information processing. The same is the case for *knowledge-based* or *vigilance* tasks and as well for tasks with a sensory modality other than *visual/spatial* (*auditory*, *haptic* or *vestibular*). Also *double* tasks are relatively seldom investigated or tasks with *semantic* information. Moreover, *continuous* or *dynamic* tasks are less frequently investigated than *discrete* or *static* tasks. Regarding the instruction there is a clear focus on *speed & accuracy*, whereas the frequency of tasks in which *speed* is emphasised in the instruction is low. If memory is investigated, tasks refer more frequently to short-term than to long-term memory, and more frequently to recognition than to free or cued recall. Lastly, most tasks are assigned to a *medium* stress level and to a *simple* motor complexity.

[7] The two dimensions “memory” and “memory recall” are missing, because they only concern memory tasks.

Table 4: Frequencies of findings regarding the dimensions and subdimensions.

Dimensions & subdimensions	N[8]	%
1) Stages of inform. processing 1	2961	100
- Active search	30	1.0
- Sensory perception	260	8.8
- Feature extraction	1101	37.2
- Operation/processing	701	23.7
- Decision	42	1.4
- Reaction planning	218	7.4
- Motor output	609	20.6
2) Stages of inform. processing 2	2061	100
- Active search	2	0.1
- Sensory perception	181	8.8
- Feature extraction	21	1.0
- Operation/processing	313	15.2
- Decision	11	0.5
- Reaction planning	1231	59.7
- Motor output	302	14.7
3) Type of attention	2075	100
- Alertness	836	40.3
- Sustained	1063	51.2
- Vigilance	176	8.5
4) Task combination	2955	100
- Single – discrete	1728	58.5
- Single – continuous	810	27.4
- Double – 2x discrete	203	6.9
- Double – discrete & continuous	202	6.9
- Double – 2x continuous	12	0.4
5) Task pace	2717	100
- Self paced	1181	43.5
- Task paced	1536	56.5
6) Kind of stress	2967	100
- Speed	273	9.2
- Accuracy	959	32.3
- Speed & accuracy	1735	58.5

Dimensions & subdimensions	N	%
7) Stress level	2967	100
- Low	902	30.4
- Medium	1374	46.3
- High	691	23.3
8) Sensory modality	2761	100
- Visual/spatial	2444	88.5
- Auditory	171	6.2
- Haptic	14	0.5
- Vestibular	132	4.8
9) Type of information	2666	100
- Formal/abstract	2261	84.8
- Semantic	405	15.2
10) Sensory dynamics	2681	100
- Static	2002	74.7
- Dynamic	679	25.3
11) Operation level	2967	100
- Skill-based	1345	45.3
- Rule-based	1566	52.8
- Knowledge-based	56	1.9
12) Memory	2967	100
- No memory	2619	88.3
- Short-term memory	239	8.1
- Long-term memory	109	3.7
13) Memory recall	2967	100
- No memory	2619	88.3
- Recognition	179	6.0
- Cued recall	45	1.5
- Free recall	124	4.2
14) Motor complexity	2753	100
- Simple	1218	44.2
- Medium	961	34.9
- High	574	20.8

There are three specific features of this new classification system. First, every performance finding is classified in every dimension, so that every subdimension can be analysed using the total number of findings. Second, tasks with the same performance requirements are classified in the same way regardless of their name in the study (e.g. a so-called attention test may be in fact a simple reaction time test). Third, tasks in real traffic can be described on the same dimensions, so that predictions from experimental research might become possible concerning the kind of traffic situation in which drivers under the influence of alcohol will have problems.

[8] The frequencies within the dimensions do not sum up to the overall 2983 performance findings, because some findings could not be classified on every dimension.

3.3.2.5 Consistency of the classification

In order to minimise the danger of inconsistencies regarding the classification procedure, all occurring performance tests were entered into an extra table together with a short description and their classification (discussed by two raters beforehand) on all dimensions. So if a performance test is conducted in the same way in another study, the same classification is guaranteed. If the performance test is conducted in a slightly modified way, the corresponding subdimensions are changed. For example, in one study a simple reaction time task takes ten minutes and subjects have to respond to a circle appearing on the computer screen. In another study a simple reaction time task takes two minutes and subjects have to respond to a tone. In the first study *sustained attention* (on the dimension “attention”) and *visual* (on the dimension “sensory modality”) is classified, in the second one *alertness* and *auditory*. The classification on all the other dimensions remains the same.

Moreover, for each performance test all corresponding publications are listed in a table in order to change the classification on the dimensions in a consistent way if necessary.

3.3.2.6 Interrater reliability

Since the process-/task-oriented classification system is a new approach for classifying performance tasks, it has to be tested how well-defined the system is. Overall, more than 150 tasks were classified by the author team, but there always will be new tasks used in scientific studies, which are not yet classified. So the question arises whether the established rules for classifying are also clear enough and plausible for non-involved academics (in the following called “non-experts”) who want to apply the system.

To answer this question, the interrater reliability is evaluated by choosing 19 performance tasks from the different tasks used in the studies. They were selected according to the frequency of their application in the studies and according to the parameter subcategories from the former classification system. This means that from each parameter subcategory the most frequent task was chosen for assessing the interrater reliability. Then, descriptions of the tasks (see Chapter 8.3) and classification rules for all dimensions (see Chapter 8.1.2.2) were given to three postgraduate psychologists, who were asked to classify each task on each dimension. Table 5 shows an example for the classification of tasks by one rater.

Table 5: Extract of the classification of some tasks by one rater on the dimensions.

Task	Parameter sub category
Simple visual RT	Simple RT
Four choice RT	Choice RT
Digit symbol substitution task	Categorisation tasks
Mackworth Clock Test	Vigilance
D2-Test	Cancellation test
Serial seven	Mental arithmetics
Go/NoGo task	Other attention tests
DA: visual & aud. discrimination**	Reactions to 2 stimuli
DA: visual & aud. discrimination**	Reactions to 2 stimuli
Circular lights	Hand-eye-coordination
Balance test	Posture
Finger tapping	Other motor function
Pursuit rotor	Easy pursuit tracking
Recall task	Memory
Road tracking	Driving simulator

	Task combination					
Task	no specification possible	single - discrete	single - continuous	double - 2 x discrete	double - discrete &	double – 2 x continuous
Simple visual RT		×				
Four choice RT		×				
Digit symbol substitution task		×				
Mackworth Clock Test		×				
D2-Test		×				
Serial seven		×				
Go/NoGo task		×				
DA: visual & aud. discrimination**				×		
DA: visual & aud. discrimination**				×		
Circular lights		×				
Balance test			×			
Finger tapping		×				
Pursuit rotor			×			
Recall task		×				
Road tracking			×			

	Stages of inform. processing 1*							
Task	no specification possible	active search	sensory perception	feature extraction	operation/processing	decision	reaction planning	motor output
Simple visual RT							×	
Four choice RT				×				
Digit symbol substitution task				×				
Mackworth Clock Test			×					
D2-Test				×				
Serial seven					×			
Go/NoGo task				×				
DA: visual & aud. discrimination**				×				
DA: visual & aud. discrimination**				×				
Circular lights			×					
Balance test								×
Finger tapping								×
Pursuit rotor								×
Recall task					×			
Road tracking					×			

	Stages of inform. processing 2*							
Task	no specification possible	active search	sensory perception	feature extraction	operation/processing	decision	reaction planning	motor output
Simple visual RT			×					
Four choice RT							×	
Digit symbol substitution task							×	
Mackworth Clock Test							×	
D2-Test							×	
Serial seven	×							
Go/NoGo task							×	
DA: visual & aud. discrimination**							×	
DA: visual & aud. discrimination**							×	
Circular lights							×	
Balance test	×							
Finger tapping	×							
Pursuit rotor					×			
Recall task	×							
Road tracking								×

	Attention				Task pace		
Task	no specification possible	alertness	sustained	vigilance	no specification possible	self paced	task paced
Simple visual RT		×					×
Four choice RT			×				×
Digit symbol substitution task		×				×	
Mackworth Clock Test				×			×
D2-Test			×			×	
Serial seven	×					×	
Go/NoGo task			×				×
DA: visual & aud. discrimination**			×				×
DA: visual & aud. discrimination**			×				×
Circular lights		×				×	
Balance test	×				×		
Finger tapping	×					×	
Pursuit rotor		×					×
Recall task	×					×	
Road tracking			×			×	

	Stress kind				Stress level			
Task	no specification possible	speed	accuracy	speed & accuracy	no specification possible	low	medium	high
Simple visual RT		×				×		
Four choice RT				×			×	
Digit symbol substitution task				×			×	
Mackworth Clock Test				×		×		
D2-Test				×			×	
Serial seven				×			×	
Go/NoGo task				×			×	
DA: visual & aud. discrimination**				×				×
DA: visual & aud. discrimination**				×				×
Circular lights				×			×	
Balance test			×			×		
Finger tapping		×				×		
Pursuit rotor			×				×	
Recall task				×			×	
Road tracking			×			×		

	Sensory modality					Type of inform.		
Task	no specification possible	visual/spatial	auditory	haptic	vestibular	no specification possible	formal/abstract	semantic
Simple visual RT		×					×	
Four choice RT		×					×	
Digit symbol substitution task		×					×	
Mackworth Clock Test		×					×	
D2-Test		×					×	
Serial seven		×						×
Go/NoGo task		×					×	
DA: visual & aud. discrimination**		×					×	
DA: visual & aud. discrimination**			×				×	
Circular lights		×					×	
Balance test					×	×		
Finger tapping	×					×		
Pursuit rotor		×					×	
Recall task			×					×
Road tracking		×					×	

	Sensory dynamics			Operation level			
Task	no specification possible	static	dynamic	no specification possible	skill	rule	knowledge
Simple visual RT		×			×		
Four choice RT		×				×	
Digit symbol substitution task		×				×	
Mackworth Clock Test		×			×		
D2-Test		×				×	
Serial seven		×				×	
Go/NoGo task		×				×	
DA: visual & aud. discrimination**		×				×	
DA: visual & aud. discrimination**		×				×	
Circular lights		×			×		
Balance test	×				×		
Finger tapping	×				×		
Pursuit rotor			×		×		
Recall task		×				×	
Road tracking			×		×		

	Memory				Memory recall				
Task	no specification possible	no memory included	STM	LTM	no specification possible	no memory included	recognition	cued recall	free recall
Simple visual RT		×				×			
Four choice RT		×				×			
Digit symbol substitution task		×				×			
Mackworth Clock Test		×				×			
D2-Test		×				×			
Serial seven		×				×			
Go/NoGo task		×				×			
DA: visual & aud. discrimination**		×				×			
DA: visual & aud. discrimination**		×				×			
Circular lights		×				×			
Balance test		×				×			
Finger tapping		×				×			
Pursuit rotor		×				×			
Recall task			×						×
Road tracking		×				×			

	Motor complexity			
Task	no specification possible	simple	medium	high
Simple visual RT		×		
Four choice RT			×	
Digit symbol substitution task			×	
Mackworth Clock Test		×		
D2-Test		×		
Serial seven		×		
Go/NoGo task		×		
DA: visual & aud. discrimination**		×		
DA: visual & aud. discrimination**		×		
Circular lights			×	
Balance test				×
Finger tapping			×	
Pursuit rotor			×	
Recall task	×			
Road tracking		×		

*The dimension "stages of information processing" exists two times, namely as "stages of information processing 1" and as "stages of information processing 2", since a second stage might be necessary for classifying some tasks.

**The two individual tests of the divided attention tasks (DA) are classified separately.

Firstly, the agreement of the three raters with the expert (=author team) is analysed. For this purpose, the task classification of each rater on each dimension is compared with the expert's classification. The higher the number of identical ratings between expert and rater is, the higher the interrater reliability will be. The percentage of agreement between rater and expert is calculated as follows (Wirtz & Caspar, 2002, p. 47):

$$\boxed{\mathit{Percentage\ Agreement}\,(2\ \mathit{Raters}) = \frac{\mathit{Number\ Of\ Identical\ Rated\ Dimensions\ Per\ Task}}{\mathit{Number\ Of\ Overall\ Rated\ Dimensions}} * 100\%}$$

There are 14 dimensions on which the tasks are classified. If, for example, the rater and the expert agree on 13 dimensions, the agreement will be (13/14)*100 = 92.86% for this task.

Since there are three raters, the above calculation is done three times for each task. The overall percentage agreement between raters and expert is simply their mean agreement:

$$\boxed{\mathit{Overall\ Percentage\ Agreement} = \frac{\sum \mathit{Percentage\ Agreement\ Of\ Each\ Rater}}{\mathit{Number\ of\ Raters}}}$$

For instance, the agreement concerning the four-choice reaction time task is 92.86% for rater 1, 80% for rater 2 and 100% for rater 3. So the overall agreement for this task is (92.86% + 80% + 100%)/3 = 90.95%. Table 6 shows the percentage agreement between the three raters and the expert for each of the 19 performance tasks.

Table 6: Percentage agreement of three raters with the expert concerning typical performance tasks.

	Performance Tasks	**Agreement with Expert (%)**		**Performance Tasks**	**Agreement with Expert (%)**
1	Four-choice reaction time	95.24	12	Circular lights	78.57
2	Simple visual reaction time	90.48	13	D2-Test	78.57
3	Balance test	90.48	14	Tracometer	78.57
4	Mackworth Clock	88.10	15	Rapid vis. inf. processing	78.57
5	Go/NoGo: resp. inhibition	88.10	16	DA**:** <u>track.</u> & vis. att. (1)	78.57
6	DA: <u>vis.</u> & aud. discr. (1)	88.10	17	DA: track. & <u>vis. att.</u> (2)	78.57
7	Pursuit rotor task	85.71	18	Recall task	76.19
8	Compensatory tracking	85.71	19	Serial seven	76.19
9	DA: vis. & <u>aud. discr.</u> (2)	85.71	20	Critical compens. tracking	71.43
10	Finger tapping	83.33	21	Road Tracking: SDLP	69.05
11	Digit symbol substitution	83.33		**All tasks (mean)**	**82.31**

The best agreement is 95.24% for the four-choice reaction time test, whereas the worst is 68.89% for the Road Tracking Test with the standard deviation of lateral position (SDLP) as dependent variable. Obviously, the classification of tasks which are quite simple and rather definite is easier than the classification of tasks which are more complex. The mean agreement concerning all tasks is 82.31%.

Next the percentage of agreement between the three raters and the expert concerning the different dimensions is analysed. To evaluate the interrater reliability for the dimensions, the classification of each rater on each dimension is compared across all performance tasks with the expert's classification. The percentage of agreement between rater and expert is calculated as before (Wirtz & Caspar, 2002, p. 47).

21 tasks (19 + 2, because the two individual tests of the divided attention tasks are classified separately) were classified. So if, for example, 19 tasks are classified identically on one dimension by the rater and the expert, the agreement will be (19/21)*100 = 90.48%. As before, this calculation is done three times per dimension for each of the three raters, and for the overall agreement between raters and expert the mean value is taken. Table 7 shows the agreement between the three raters and the expert for each dimension.

Table 7: Percentage agreement of three raters with the expert concerning the dimensions.

	Dimension	**Agreement with Expert (%)**		**Dimension**	**Agreement with Expert (%)**
1	Memory	100.00	8	Task paced	84.13
2	Memory recall	100.00	9	Stress kind	82.54
3	Type of information	96.83	10	Operation level	79.37
4	Sensory modality	93.65	11	Stages of inf. processing 1	77.78
5	Sensory dynamics	93.65	12	Motor complexity	66.67
6	Task combination	92.06	13	Stress level	60.32
7	Attention	85.71	14	Stages of inf. processing 2	39.68
				All dimensions (mean)	**82.31**

The dimensions with the best agreement are the both memory dimensions with 100% each. This is not surprising since the type of memory is easy to determine. The dimension with the worst agreement is the second stage of information processing of the task with only 39.68% agreement. This results from the fact that two of the raters hardly ever classified a second stage of information processing. Agreement is also low for the stress level and the motor complexity of the task. This can be explained by the fact that the decision of whether a task is considered as stressful and complex is quite a subjective one. The mean agreement concerning all dimensions is 82.31%, which is quite satisfactory.

In addition, the agreement of the raters among each other is analysed. This means, the consistency of ratings made by the different raters is checked by comparing the raters' classifications among each other without presuming that the expert's classification is best. So each pairwise agreement is considered as equal, no matter if it is between expert and rater or between rater and rater. First, the analysis is done with four raters (expert included) and second with three raters (expert not included). If the interrater reliability is higher when the expert is not included, this will indicate a non plausible expert's rating or that the rules explaining the expert's classification are not easily understandable for non-experts.

The interrater reliability for more than two raters is calculated in the following way (Wirtz & Caspar, 2002, p. 48):

$$Percentage\ Agreement\ (>2\ Raters) = \frac{\dfrac{Number\ Of\ Rater\ Pairs\ With\ Identical\ Ratings}{Number\ Of\ Rated\ Tasks}}{Number\ Of\ Rater\ Pairs} * 100\%$$

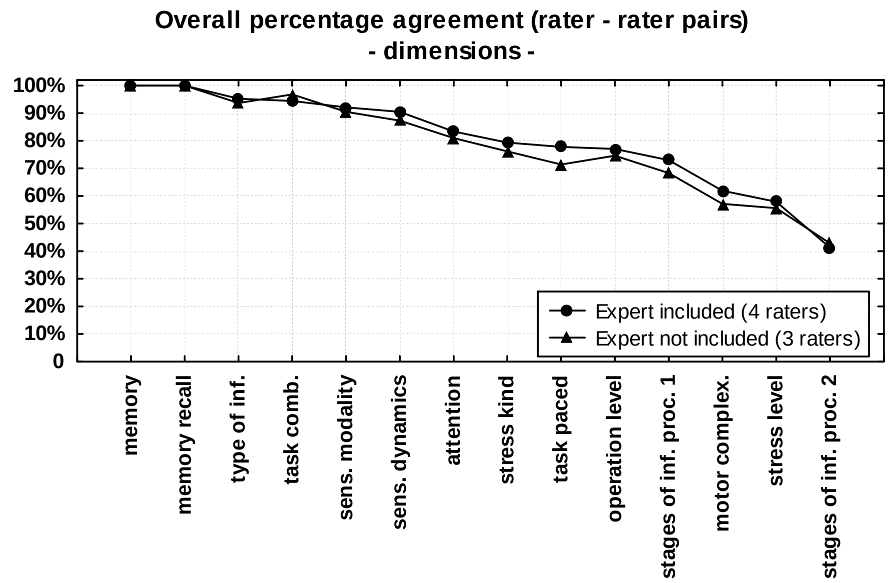
With:

$$Number\ Of\ Rater\ Pairs = \binom{R}{2} = \frac{R!}{(R-2)!*2!}$$

For example, the interrater reliability for four raters concerning the dimension "attention" is calculated as follows:

$$Percentage\ Agreement\ (4\ Raters) = \frac{\dfrac{105}{21}}{\dfrac{4!}{(4-2)!*2!}} * 100\% = \frac{5}{6} * 100\% = 83.33\%$$

In Figure 13 the percentage of agreement between the four raters (expert included) and between the three raters (expert not included) for the 14 dimensions is shown.



	Mean	Minimum	Maximum
Overall percentage agreement (expert included)	80.27	41.27	100.00
Overall percentage agreement (expert not included)	78.23	42.86	100.00

Figure 13: Percentage agreement of four or three raters (expert included and not included, respectively) concerning the dimensions.

The mean interrater reliability for all dimensions is 80.27% if the expert is included and 78.23% if the expert is not included. So there is hardly any difference between the two reliabilities and the same holds true for each of the dimensions as shown by the graph.

3.3.3 Additional input fields

Independent of the classification system, there are some variables that are specified for each finding as well. For example, the majority of performance tasks are evaluated in the studies in a twofold manner, under a *speed* perspective (reaction times) and under an *accuracy* perspective (error rates). Sometimes both of these perspectives are combined (e.g. number of correct responses in a given time), so that *speed & accuracy* is classified as "type of parameter"[9]. Of course, this distinction can only be made in performance findings.

Another variable is the training of the task before the experiment in order to avoid learning effects in a performance or driving test. When training is not mentioned, *no specification possible* is marked.

[9] The variable "type of parameter" is not to be confounded with the dimension "kind of stress" which refers to the instruction.

Moreover, a free text field is added for a better understanding of the task. There the name of the task is entered, as well as a short description of it and the measured parameter (e.g. “Tone discrimination task: press a button upon detection of a rare target tone; reaction time”).

3.4 Classification of results

3.4.1 Statistical significance

Generally, in a meta-analysis different methodological issues can be used: The two main procedures are the method of vote-counting and the method of effect sizes. Vote-counting means that the number of significant findings (positive vs. negative) as well as the number of non-significant findings are simply summarised over the different studies. This procedure permits merging the analyses of different studies and requires a minimal amount of statistical data (Hedges, L. V. & Olkin, I., 1980). However, this method using statistical significance does not give much information about the size of the effect, because statistical significance only indicates that the result is not due to chance. The method of effect sizes in contrast includes the difference between population mean values. This means an effect size specifies the extent to which two populations are separated due to the experimental procedure (Aron, A., Aron, E. N. & Coups, E. J., 2006, p. 190).

Regarding the classification of results an important methodological requirement is to define what will be treated as a substance effect. This question is answered pragmatically according to the standard research convention:

A finding of effect exists if an alcohol-placebo comparison is done on a variable at a certain time point with a certain alcohol dosage in a study meeting all inclusion criteria and no exclusion criterion. If the statistical null hypothesis can be rejected on a significance level of $\alpha = 5\%$, a detrimental (-) or beneficial (+) effect of alcohol is recorded in the database. If the null hypothesis cannot be rejected, alcohol is in its effects not different from placebo (0). Detrimental effects on performance are coded as *decrease* in the field “EffectPerf” (Perf = performance), beneficial effect as *increase*. In order to have another coding of the effects regarding the semantic meaning of the description of the parameter, the effect is coded in the field “EffectPar” (Par = parameter) as well. So if alcohol leads to an increase of reaction time, the “EffectPar” is *increase*, but the “EffectPerf” is *decrease* (see Figure 14).

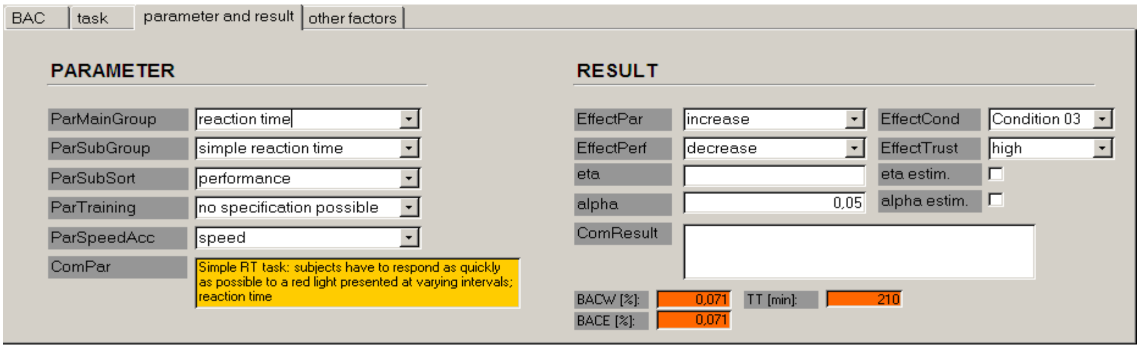


Figure 14: Example of a database entry reporting the parameter categories and the effects.

3.4.2 Effect sizes

In addition to the classification of the results into effect vs. no effect, the effect sizes have also tried to be determined. To estimate the strength of the alcohol effect, eta-squared (η^2) as a coefficient of determination is calculated which gives the proportion of explained variance to the total variance. There are different possibilities to calculate eta-squared depending on the information given in the studies. Table 8 shows the different formulas which are needed for the computations (Rosenthal, 1991, p. 66).

Table 8: Formulas to calculate eta-squared depending on the available information.

Case	**Available information**	**Formula**	**Comment**
ANOVA: 1 factor (1 paired sample or 2 samples)	F-value and degrees of freedom (df)	$\eta^2 = \frac{F * df_1}{df_2 + F * df_1}$	$F = F_{(effect)}$ $df_1 = df_{(effect)} = n_{(levels)}-1$ $df_2 = df_{(error)}$
ANOVA: >1 factor (1 paired sample or 2 samples)	only F-value of effect	$\eta^2 = \frac{F * df_1}{df_2 + F * df_1}$ actually (if all F-values and df are reported): $\eta^2 = \frac{F_{(A)} * df_{(A)}}{F_{(A)} * df_{(A)} + F_{(B)} * df_{(B)} + F_{(AB)} * df_{(AB)} + df_{(R)}}$	$F = F_{(effect)}$ $df_1 = df_{(effect)} = n_{(levels)}-1$ $df_2 = df_{(total)}-df_{(effect)}$ Assumption: F-values of other effects = 1
ANOVA: 1 factor (1 paired sample or 2 samples)	t-value and sample size n	$\eta^2 = \frac{t^2}{n - 2 + t^2}$	2 samples: $n = n_{(total)} = n_1+n_2$ 1 paired sample: $n = n_{(total)} = n_1+n_1$

The first formula is used to calculate eta-squared via the F-value. Even if there is more than one factor (see second row), this formula has to be used, since there is no study in which all F-values and df are reported. df_1 is the number of factor levels minus “1”. Since the findings always refer to one BAC level, the F-value of the post hoc test has to be taken. Therefore df_1 is always "1", even if there are actually more levels of the factor alcohol. The last formula can be used, if the t-value is given.

In some of the studies, in which the F- or t-values are not available, means and standard deviations are reported. In these cases the following formulas (see Table 9) are used to calculate the t-value (Bortz, 2005, p. 262).

Table 9: Formulas to calculate the t-value depending on the available information.

Case	**Available information**	**Formula**	**Comment**
2 samples	n_1, n_2, m_1, m_2, s_1, s_2	$t = \frac{m_2 - m_1}{\sqrt{\frac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2} * \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$	
	n_1, n_2, m_1, m_2, var_1, var_2	$t = \frac{m_2 - m_1}{\sqrt{\frac{n_1 \mathrm{var}_1 + n_2 \mathrm{var}_2}{n_1 + n_2 - 2} * \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$	with s = sqrt(var) ⇨ var = s^2
	n_1, n_2, m_1, m_2, SEM_1, SEM_2	$t = \frac{m_2 - m_1}{\sqrt{\frac{n_1^2 SEM_1^2 + n_2^2 SEM_2^2}{n_1 + n_2 - 2} * \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$	with s = SEM*sqrt(n) ⇨ SEM = s/sqrt(n) ⇨$s^2 = SEM^2$*n
1 paired sample		same formulas with $n_1 = n_2$	

The formulas for two samples can also be used for one paired sample by applying the same sample size (n) for n_1 and n_2. If eta-squared needs to be estimated by one of these formulas for a within-subject design, this is coded in the database in a boolean variable named "eta estimation".

3.4.3 Consideration of multi-factorial designs

In many studies, there is not only the factor alcohol of interest, but also other factors which might influence the performance. If there is a multi-factorial design, the interesting interactions are reported in the following way: First, the factor is described in a free text field without categorisation (see Figure 15). Thereby the levels of the factor are written down in such a way that the coding of the effect refers to that level which is named first. If, for example, there is a significant interaction of BAC and gender in such a way that the effect of alcohol on the proportion of errors in an attention test is stronger in women, the text should be: "female vs. male" in combination with *increase* in the field "F1EffectPar" and *decrease* in the field “F1EffectPerf”. If there is no significant interaction, *no change* has to be selected in both fields. Moreover, the factor is assigned to one of the following categories: *gender*, *personality*, *motivation*, *beliefs*, *state/fatigue*, *signal quality*, *compatibility*, *stimulus timing*, *workload/difficulty*, *complexity/dimension*, *external stress*, *other substances* or *no specification possible*. A further free text field (“ComFac”) exists to give comments about the factor or the interaction. It is possible to enter up to three factors besides alcohol into the database.

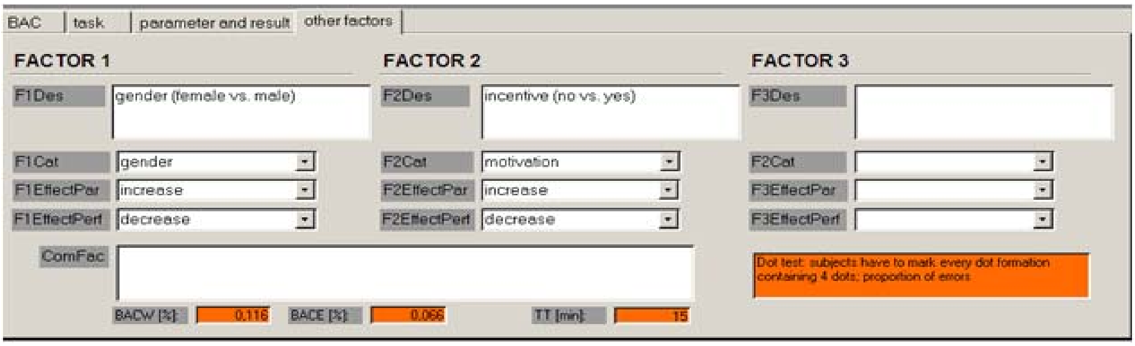


Figure 15: Example of a database entry reporting interactions or no interactions of alcohol with other factors.

3.4.4 Confidence rating of effects

Due to the different trustworthiness of the results in the publications, a system for rating the effects regarding their confidence level is introduced (see Figure 16). It distinguishes – in words of an analysis of variance – whether the main effect of alcohol is significant or not and whether there are interactions or not. If the main effect is significant, the level of confidence depends on the order of interactions (e.g. two-way or three-way interaction) and on the way of reporting them. However, this rating system needs only to be applied in a multi-factorial design. If there is just the factor alcohol, the confidence of the effect is always high.

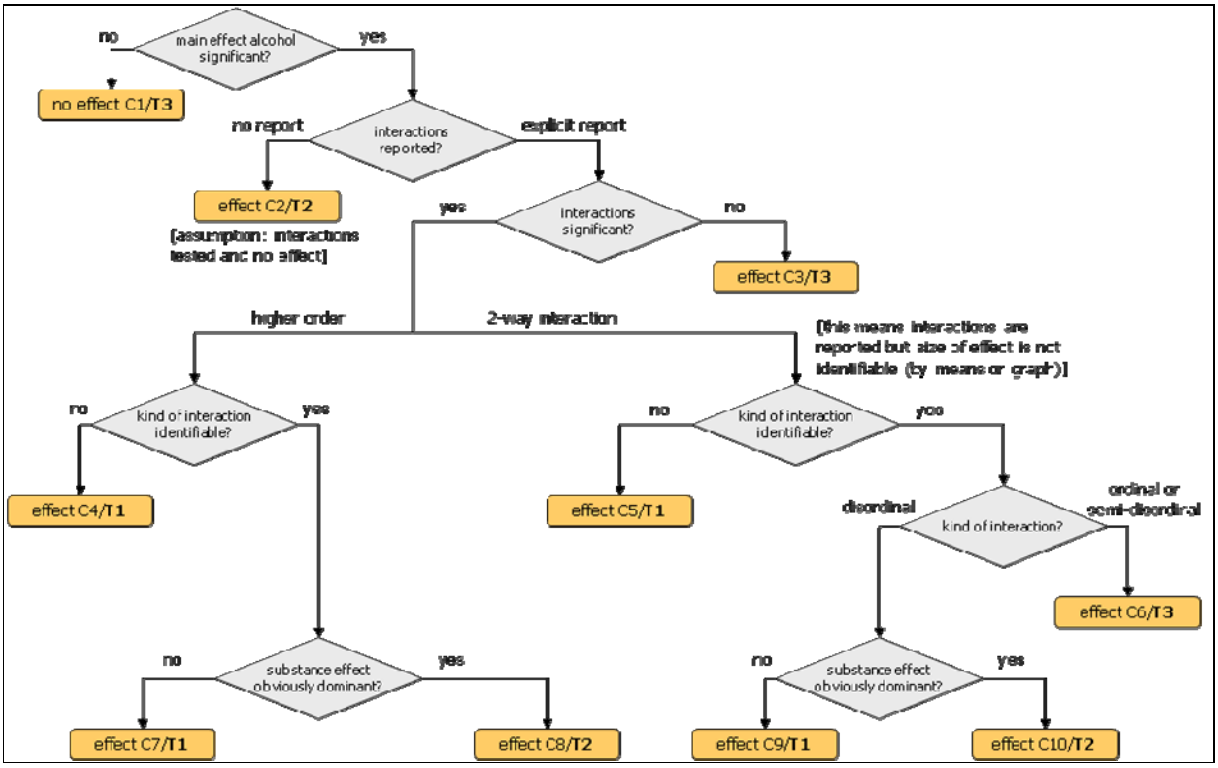


Figure 16: Decision tree in order to rate the confidence of the effect depending on the given information and kind of evaluation in the publication.

A high confidence (T3) is given

- if the main effect of alcohol is not significant (C1),
- if the main effect is significant and no interactions are significant (C3),
- if the main effect is significant, and significant interactions are well-reported and "ordinal" or "hybrid"/semi-disordinal (Bortz, 2005, p. 301) (C6).

A medium confidence (T2) is given

- if the main effect of alcohol is significant and interactions are not reported (C2),
- if the main effect is significant and significant interactions are reported, and these are "disordinal" (Bortz, 2005, p. 301) or by a higher order (more than 2 factors, i.e. a three-way interaction), but the main effect of alcohol is obviously dominant (C8, C10).

A low confidence (T1) is given

- if the main effect of alcohol is significant and significant interactions are reported, but the kind of interaction cannot be identified because no means or graphs are reported (C4, C5),
- if the main effect is significant and significant interactions are reported, but they are "disordinal", and the main effect of alcohol is not obviously dominant (C7, C9).

4 EVALUATION

4.1 Establishing the „impairment function"

As already mentioned in Chapter 3.4.1, the presence or absence of a significant alcohol effect is coded. From a meta-analytic perspective, this procedure belongs to the method of vote-counting. This means the significant findings of effects are summarised per parameter for the same BAC groups. Thereby, the number of significant detrimental (performance decreases) or beneficial (performance increases) effects and the number of non-significant effects (no change) always add up to 100%. Concerning the results, the percentages of significantly impaired findings per BAC group are displayed. This empirical function was interpreted as an "impairment function" by Berghaus et al. in 1998 when conducting a meta-analysis of cannabis.

Regarding the effects of alcohol one would expect two types of gradients of such an impairment function (see Figure 17). Since alcohol most probably has greater impairing effects the higher the concentration is, it is assumable that the impairment function is increasing monotonously. Depending on the investigated parameter, the function might be almost linear or logarithmical. In order to smooth the function, a curve can be fitted to the XY coordinate data according to the method of least squares.

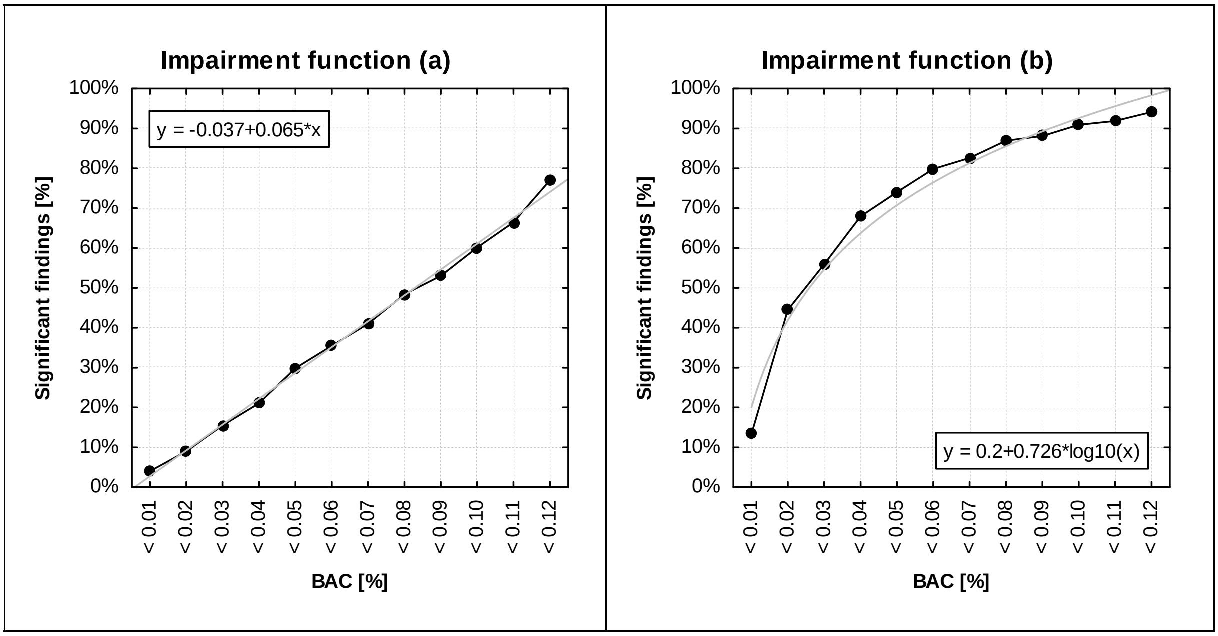


Figure 17: Examples for the gradient of an impairment function (left: linear, right: logarithmical) and a curve fitting according to the method of least squares.

For analysing the effects of alcohol, the different BACs are summarised in 0.01%-steps. For example, the lowest group (<0.01) comprises BACs from 0.001% to 0.009%, the next one (<0.02) from 0.010% to 0.019% and so on. In order to get only reliable estimations of the alcohol effects, the minimum frequency of findings per BAC group is set at 10. Thus, in this report the highest BAC group for which reliable information can be obtained is <0.12.

4.2 Consistency of results

The effect of alcohol might differ depending on the kind of evaluation and on a number of other aspects. These aspects and their impact on the results are evaluated in the following subsections.

4.2.1 Vote counting vs. effect sizes

First of all, the method of vote counting is compared to the method of estimating effect sizes. In order to get a more precise estimation of the substance effect, eta-squared is calculated. Eta-squared is an estimator of the proportion of variance explained by the corresponding factors or independent variables.

The calculation of eta-squared requires some preconditions:

(1) The statistical comparison must be done between two groups.

(2) The necessary information must be given in the publication.

If eta-squared is calculated for a two-group comparison, it reflects mainly the difference of means in the treatment conditions. Assuming that the error component in the ANOVA model and the number of subjects are constant over the BAC groups, the probability of significance should rise with higher effect sizes[10]. Unfortunately in most publications the necessary information to calculate effect sizes is only given for significant results. As a consequence, the mean effect size for BAC groups with a low proportion of significant results will be overestimated, because the great number of non-significant results with low effect sizes is not included.

In the present analysis, effect sizes could be calculated in 602 cases of the overall 1951 significant impaired findings. Since there are only 375 eta values regarding performance findings, mean values for each BAC group are determined for the general performance and not for the single performance categories. Regarding the subjective subcategory *experienced intoxication* there are at least 120 eta values. Therefore, the results of both methods concerning the general performance including driving and concerning the subjective feeling of intoxication are compared.

Regarding the performance results (Figure 18, left) the percentage of significant findings increases almost perfectly linearly with increasing BAC, whereas the effect sizes remain between 0.2 and 0.4 up to a BAC of 0.10%. This can be explained by the mentioned statistical artefact that in BAC groups with less than 50% significant findings the effect sizes are overestimated. The higher the proportion of significant findings the better the estimation of the real effect size is. Thus the effect sizes regarding the subjective feeling of intoxication (Figure 18, right) increase similarly to the percentage of significant findings, because almost all effect sizes (except η^2 at 0.02% BAC) are based on 80% significant results. The reason for the drop of the effect size at 0.11% BAC remains unclear as well as the abrupt rise of the effect size at that BAC level in performance tasks (data were checked for outliers).

[10] The error component must be postulated as constant. The number of subjects is checked and the median turns out to be rather invariant over the BAC groups.

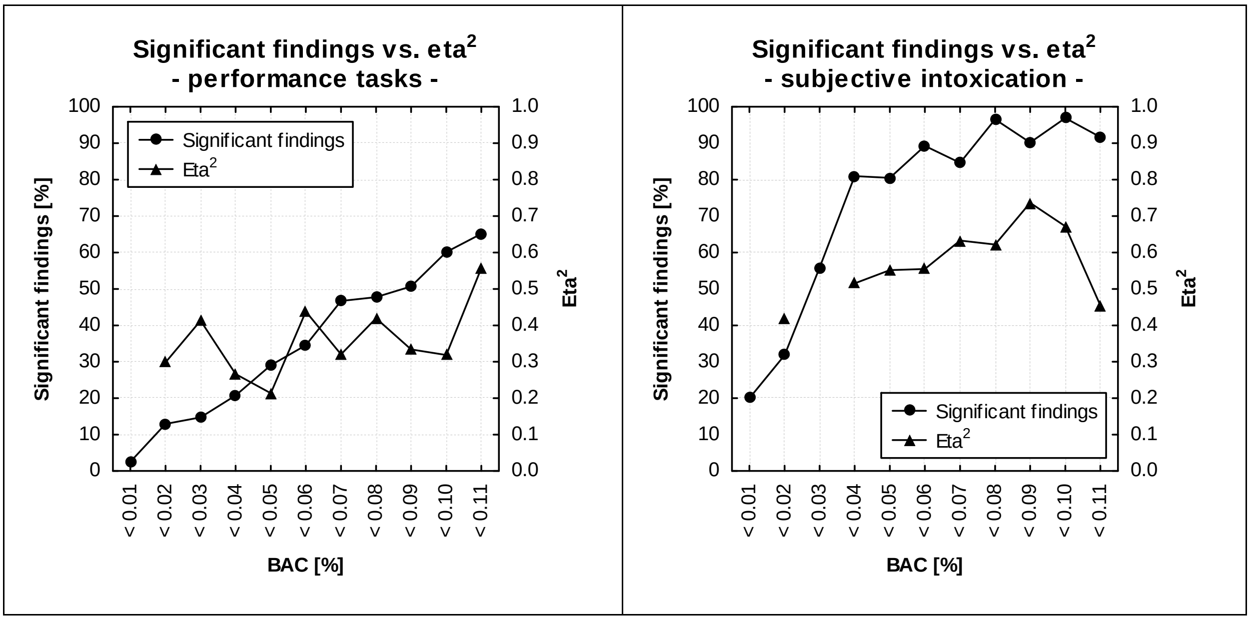


Figure 18: Comparison of the method of vote counting and the method of effect size estimation regarding the results of performance tasks (left) and subjective intoxication (right). The presented eta mean values per BAC group consist of at least three values.

Additionally it is tested if effect sizes increase with higher BACs when the same performance test is conducted under the same methodological conditions. Therefore, a closer look is taken at studies in which a performance test is conducted under different BAC levels and in which eta-squared can be calculated for each BAC level. As an example, Table 10 presents the corresponding driving studies together with the investigated BAC levels and the effect sizes. It becomes obvious that at least within the same study effect sizes increase with higher BACs. This also holds true for the majority of the other 22 studies conducting a total of 30 performance tests at different BACs.

Table 10: Effect sizes in studies conducting a driving test under different BAC levels.

Study reference	Subcategory	BAC [%]	Eta^2
Gengo, Gabos, Straley & Manning (1990)	Driving simulator	0.10	0.18
		0.11	0.29
		0.13	0.51
Rupp, Acebo, Seifer & Carskadon (2007)	Driving simulator	0.04	0.19
		0.05	0.25
Tornros & Laurell (1991)	Driving simulator	0.04	0.19
		0.16	0.62
Morrow, Yesavage, Leirer, Dolhert et al. (1993)	Flight simulator	0.07	0.21
		0.10	0.30
Ross, Yeazel & Chau (1992)	Flight simulator	0.03	0.37
		0.04	0.65
Arnedt, Wilde, Munt & Maclean (2000)	Driving simulator	0.05	0.43
		0.08	0.49

4.2.2 Multi-factorial designs

Moreover, it is of interest if other factors investigated in some studies have an influence on the effect of alcohol. More than every second study (56%) uses a multi-factorial design, and in two thirds (68%) of the findings of those studies the impact of other factors on the alcohol effect could be determined. Since there are up to three factors reported per finding, the total number of investigated interactions with alcohol is 2066. Of these, 1011 interactions refer to performance tests, on which the main interest lies. Most studies investigate the influence of other substances on the alcohol effect, followed by personality (including age and drinking habits) and gender (see Figure 19). Furthermore, the impact of the subjects' state (like fatigue), of their workload (e.g. task difficulty), beliefs (e.g. alcohol expectancy) and motivation (e.g. reward) is of interest. The figure also shows that most interactions are not significant, which means the effects of alcohol are not much influenced by other factors.

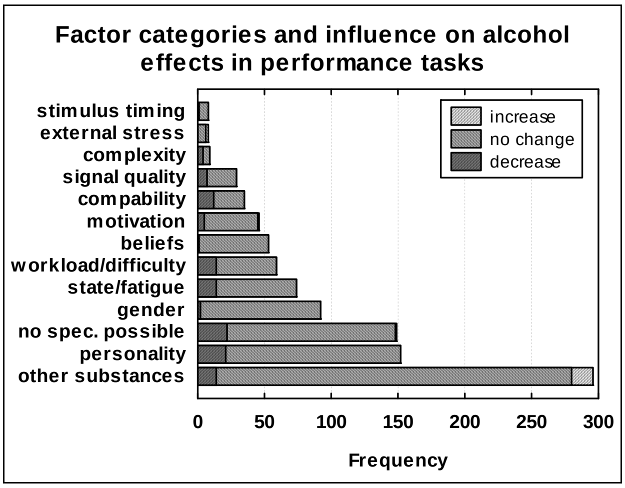


Figure 19: Categories and influence of other investigated factors than alcohol in performance tasks.

When looking more in detail at the most frequently investigated factor categories, it becomes obvious that the effects of alcohol in performance tasks are not influenced by the application of benzodiazepines (see Figure 20). In contrast, the administration of the anti-depressant befloxatone, MDMA or caffeine leads in some studies to a significant interaction in a way that the impairing effects of alcohol are reduced (coded as "increase" of performance in the figure). Regarding the gender of the subjects, a significant interaction is found only twice: once performance under alcohol decreases only in men (coded as "decrease 1") and the other time performance decreases only in women (coded as "decrease 2"). Regarding the subjects' age, 22% of the interactions become significant. In 9% impairment under alcohol is higher when older subjects perform the task, in 13% when young people are tested. If the subjects' habituation to alcohol is low, 10% of the interactions with the factor alcohol become significant. In contrast, the expectation of the subjects to get alcohol does not influence the effects of alcohol. Impairment under alcohol is higher in sleepy subjects or if performance testing takes place in the morning. Alcohol effects depend as well on the difficulty of the task. However, impairment increases not only when the task is difficult and a high workload is demanded, but even when the task is easy a negative influence is possible.

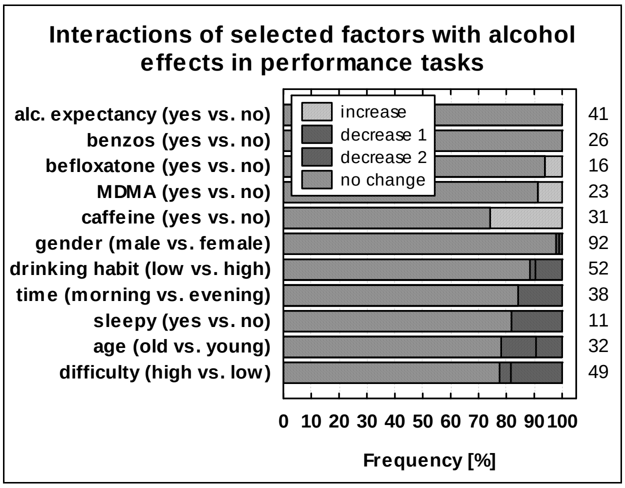


Figure 20: Interactions of selected factors with alcohol effects in performance tasks (on the right the number of interactions per factor is presented). "Decrease 1" means that the significant interaction refers to the first factor level defined in the brackets, "decrease 2" that it refers to the second factor level (explained in the text).

Regarding the feeling of intoxication the expectation to get alcohol does not influence the alcohol effect nor does the subjects' gender (see Figure 21). Subjects with a low habituation to alcohol feel more intoxicated in some studies when they get alcohol, whereas subjects feel less intoxicated in 22% of the investigated interactions with an additional cocaine application. Furthermore, there are significant interactions regarding aggressive behaviour under alcohol when subjects are provoked, are more irritable or are male. Lastly, the daytime influences the effect of alcohol on the subjective tiredness. In the morning subjects report a higher tiredness when drinking alcohol than in the evening.

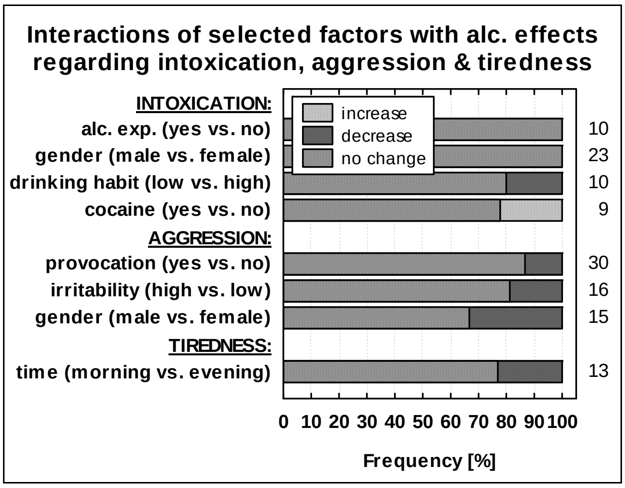


Figure 21: Interactions of selected factors with alcohol effects regarding subjective intoxication, aggression and tiredness (on the right the number of interactions per factor is presented).

4.2.3 Confidence of effects

When rating the confidence of the results according to the reported interactions in studies with a multi-factorial design (see Chapter 3.4.4), it becomes obvious that 99% of the findings are of a high confidence (see Table 11), which means that the result concerning the effect of alcohol is not biased by another factor. On the one hand, this high confidence level results from the fact that in 43% of the findings only the factor alcohol was tested and so there were no interactions to consider. Without possible interactions the confidence of the effect is always high. On the other hand, in many findings the main effect of alcohol is not significant, or the main effect of alcohol is significant, but not the interaction. Moreover, in some findings the significant interaction is ordinal or semi-disordinal. The frequencies of findings for the other conditions with a medium or low confidence level where interactions are not reported or disordinal or unidentifiable are negligible.

Table 11: Frequencies and percentages of findings per confidence level.

Confidence level	Frequency	Percent
High	5245	98.97
Medium	46	0.87
Low	9	0.16
In total	**5300**	**100.00**

4.2.4 Aspects of experimental procedure

Performance under alcohol might also be influenced by two variables concerning the experimental procedure in the studies.

4.2.4.1 Drinking time

The first one is the *drinking time*, this means the time available for drinking the alcoholic beverage. It could be determined in 86% of the findings and varied between 1 minute and 180 minutes with a median of 15 minutes (15^{th} percentile = 10 minutes; 85^{th} percentile = 30 minutes). By this feature, the influence of the speed of alcohol intake on the alcohol effects can be estimated in post-hoc analyses. For example, the consequences of drinking high alcohol quantities in a very short time can be analysed or of drinking alcohol more slowly, which is more relevant in everyday situations.

As Figure 22 (left) shows, there is only a small correlation between the alcohol dose and the drinking time (r = 0.21)[11], this means the subjects are not given more time for drinking high quantities. Thus, the drinking conditions in experimental studies differ from those in everyday life. Besides, when the drinking time is 15 minutes or less (= fast drinkers), the percentages of significantly impaired findings in performance tasks are just slightly higher than for slow drinkers, mainly with a BAC between 0.05% and 0.08% (Figure 22, right).

[11] One outlier with an alcohol dose of 1.75 g/kg and a drinking time of 180 minutes is excluded. Otherwise the correlation would be 0.34.

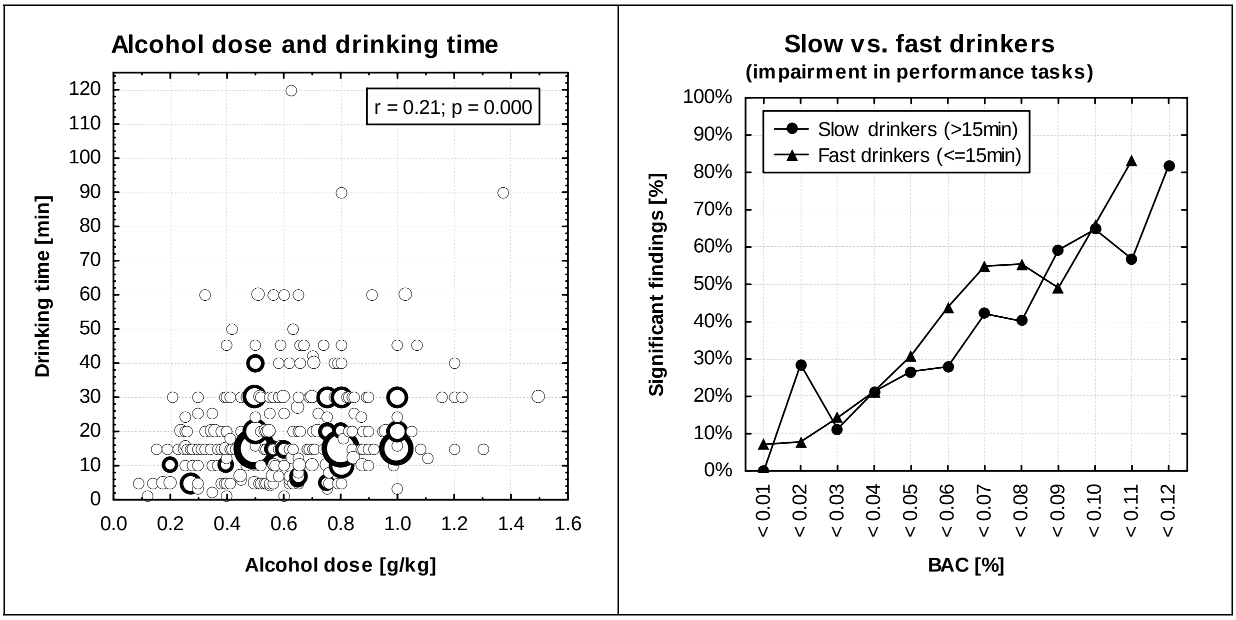


Figure 22: Correlation between alcohol dose and drinking time (left) – the size of the points symbolises the frequencies of findings; percentage of significantly impaired findings per BAC group depending on the drinking time (right).

The differences between slow and fast drinkers increase when considering the relation between the alcohol dose and the drinking time (as grams of alcohol per minute). If the subjects have to drink more than 0.0375 g/kg per minute (which is the median), more findings than in the low dose/min group become significant with a BAC above 0.05% (see Figure 23).

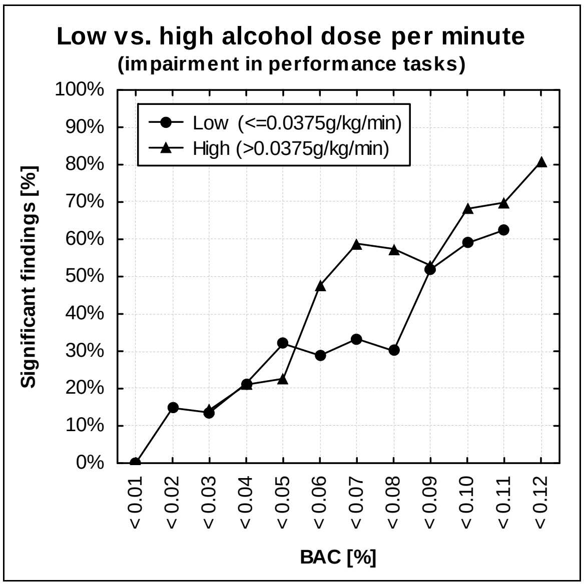


Figure 23: Percentage of significantly impaired findings per BAC group depending on the alcohol dose per minute.

4.2.4.2 Testing time

Another variable which might have an influence on performance under alcohol is the *testing time*, this means the time of day when performance testing takes place. In addition to the explicitly introduced time variable as a second factor in some studies where it is distinguished between morning and evening testing (see Chapter 4.2.2), the exact time of testing is recorded for every finding. This variable is reported in about half of the findings (51%). Performance tests were conducted at every time of the day except from 5 to 7 a.m. In some studies, a time span is reported, e.g. when a performance test battery is applied. In these cases, the mean value of the time span is taken for all tests in the study.

The percentages of significantly impaired findings in performance tasks are much higher when performance is tested after 6 p.m. or during the night (see Figure 24). Between testing in the morning (7 a.m. to 12 p.m.) and in the afternoon (12 to 6 p.m.) there is hardly a difference concerning significant findings. Therefore, during the day when subjects are normally not used to drinking alcohol, performance is best, whereas it is worst at a time of day when subjects are more likely to drink alcohol and might have to perform afterwards in some way (e.g. driving). Obviously, a late-night testing time impairs performance more than an unusual time for drinking alcohol, which indicates that fatigue is most probably interferring.

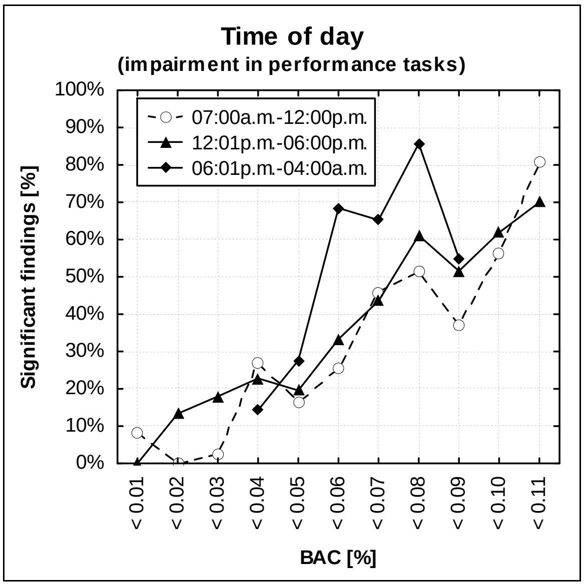


Figure 24: Percentage of significantly impaired findings per BAC group depending on the time of day of testing.

4.2.5 Aspects of the BAC

Besides the BAC level that has to be extracted from the studies as a clear effect-modifying factor, there are further important aspects concerning the BAC: firstly the distinction between the ascending and descending limb of the BAC curve and secondly, the kind of BAC estimation.

4.2.5.1 Absorptive vs. eliminative phase

In order to distinguish between the absorptive and the eliminative phase, the *time of test beginning* ("time before testing") has to be considered. This variable is defined as time between the end of the subject's alcohol intake and the beginning of measuring the study variables. These data are provided in 87% of the studies (and in 91% of the findings, respectively) and vary between 0 (which means an immediate beginning) and 900 minutes with a median of 60 minutes concerning all findings (15th percentile = 20 minutes; 85th percentile = 135 minutes). The assignment of a finding depending on the time of test beginning is explained in Chapter 3.2.1. Overall, 1599 findings belong to the absorptive phase, 3395 to the eliminative, and 306 could not be specified because of missing information.

Figure 25 (left) shows that there is no systematic difference between the absorptive and the eliminative phase concerning significantly impaired findings in performance. Only with very low BACs (0.01 and 0.03%) and with a BAC around 0.06% are absorptive findings slightly more often significant than eliminative findings.

To ensure that the absent difference between the two phases is not due to an incorrect definition, the time when testing takes place after the alcohol intake is inspected more in detail (Figure 25, right). The above defined absorptive phase is differentiated into below and above 20 minutes. Again it becomes obvious that there is hardly a difference, only with BACs between 0.03 and 0.06% are the percentages of significant absorptive findings higher.

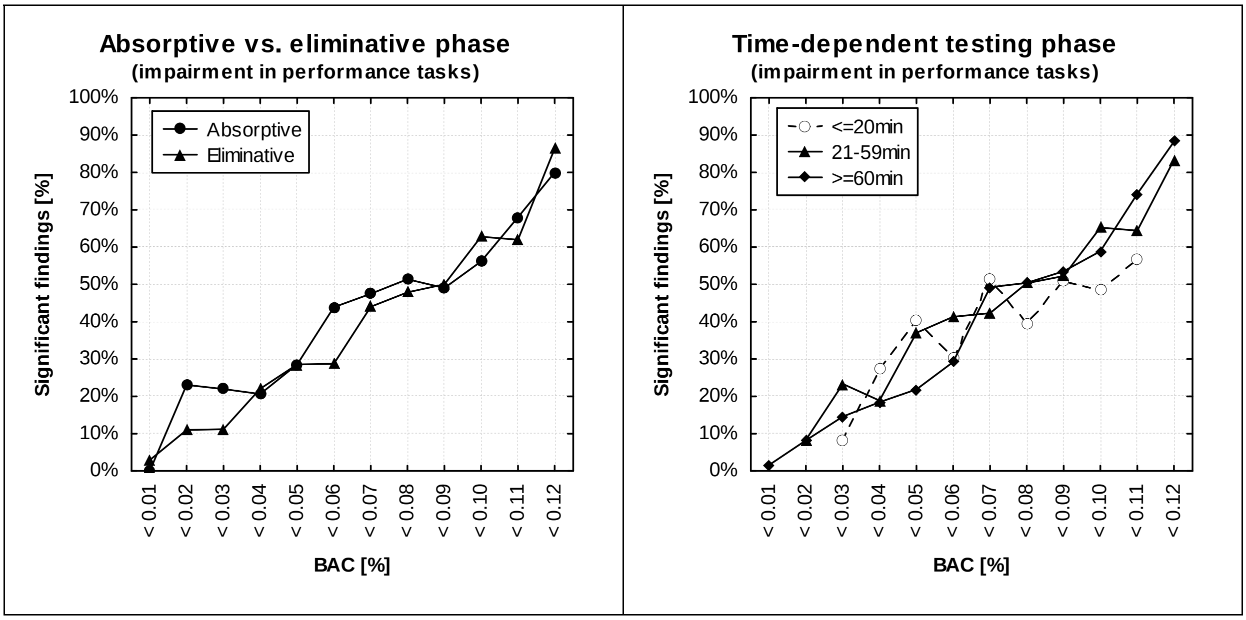


Figure 25: Percentage of significantly impaired findings per BAC group depending on the limb of the BAC curve (left) and more detailed depending on the time of testing after the alcohol intake (right).

4.2.5.2 Empirical BAC vs. Widmark estimation

In 82% of the findings the empirical BAC is determinable. It varies from 0.001 to 0.18% with a median of 0.06%. If it is not measured or reported, there are two other possibilities for estimating the alcohol concentration, namely via the target BAC (if it is reported in the studies) or via the Widmark formula (if the alcohol dose is reported) as explained in Chapter 3.2.3. In general the correlation of the empirical BAC is higher with the target BAC than with the Widmark BAC (see Figure 26).

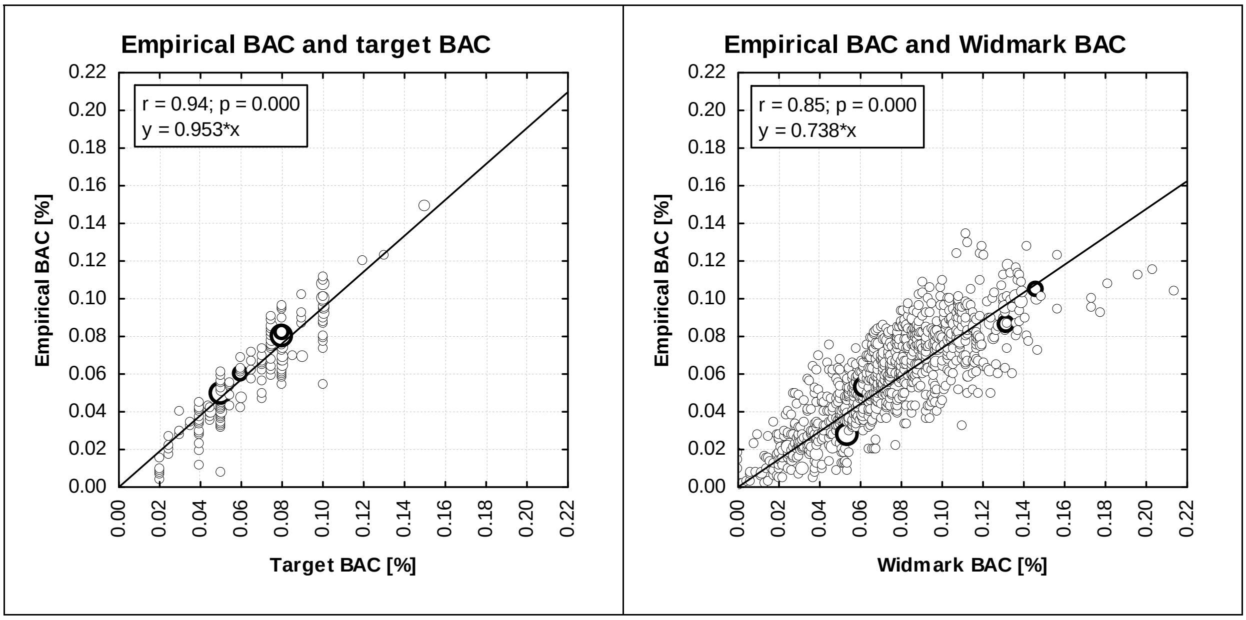


Figure 26: Correlation between the empirical BAC and the target BAC (left), and between the empirical BAC and the Widmark BAC (right) – the size of the points symbolises the frequencies.

Since the Widmark formula is intended for the case that the alcohol dose is consumed at once with an empty stomach, it has been known to overestimate the real BAC. The differences are sometimes very large, on average the Widmark BAC is 0.02% higher than the measured value (Figure 27, left). When the Widmark BAC is plotted against the difference to the empirical BAC (Figure 27, right), it can be seen that the Widmark BAC level correlates with the height of the difference (r = 0.64). The regression line reveals that the overestimation is about 33%.

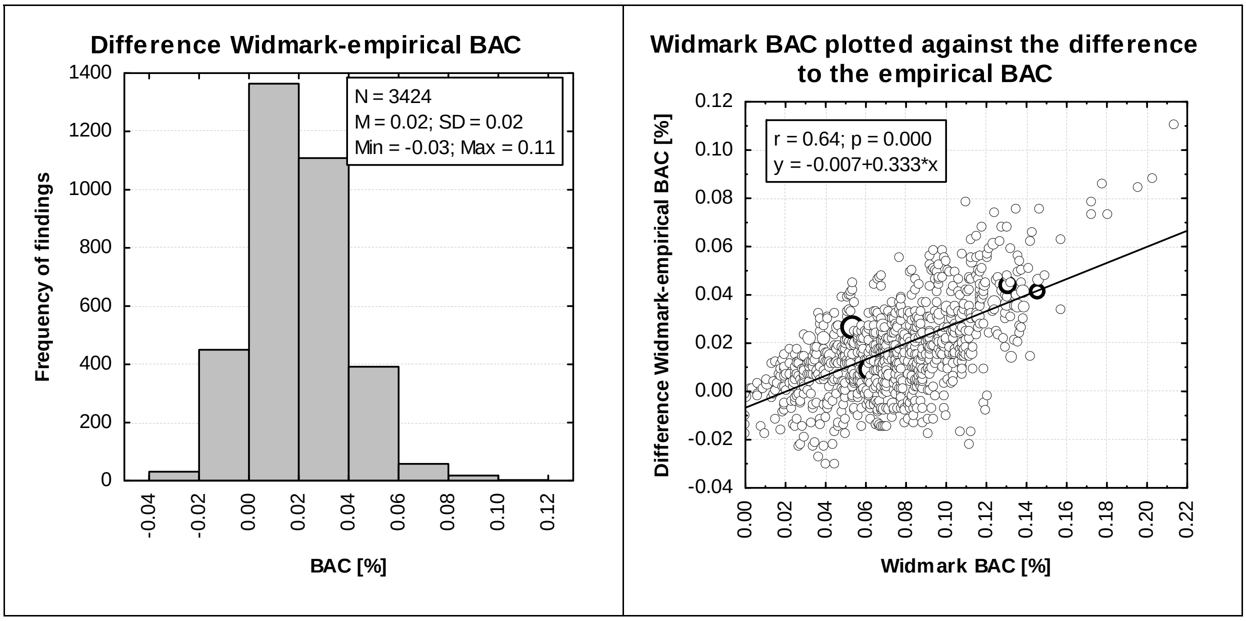


Figure 27: Difference between the Widmark and the empirical BAC (left), and Widmark BAC plotted against the difference to the empirical BAC (right) – the size of the points symbolises the frequencies.

The rather small correlation (r = 0.27)[12], which is shown in Figure 28 (left), indicates that the overestimation by Widmark does not depend on the drinking time, although it is significant. Even when subjects drink the alcoholic beverage within 10 minutes, the difference between the Widmark BAC and the measured values might be up to 0.06%. Such high overestimations only appear with a rather high alcohol dose (Figure 28, right), whereas with low doses the difference is much smaller (r = 0.57).

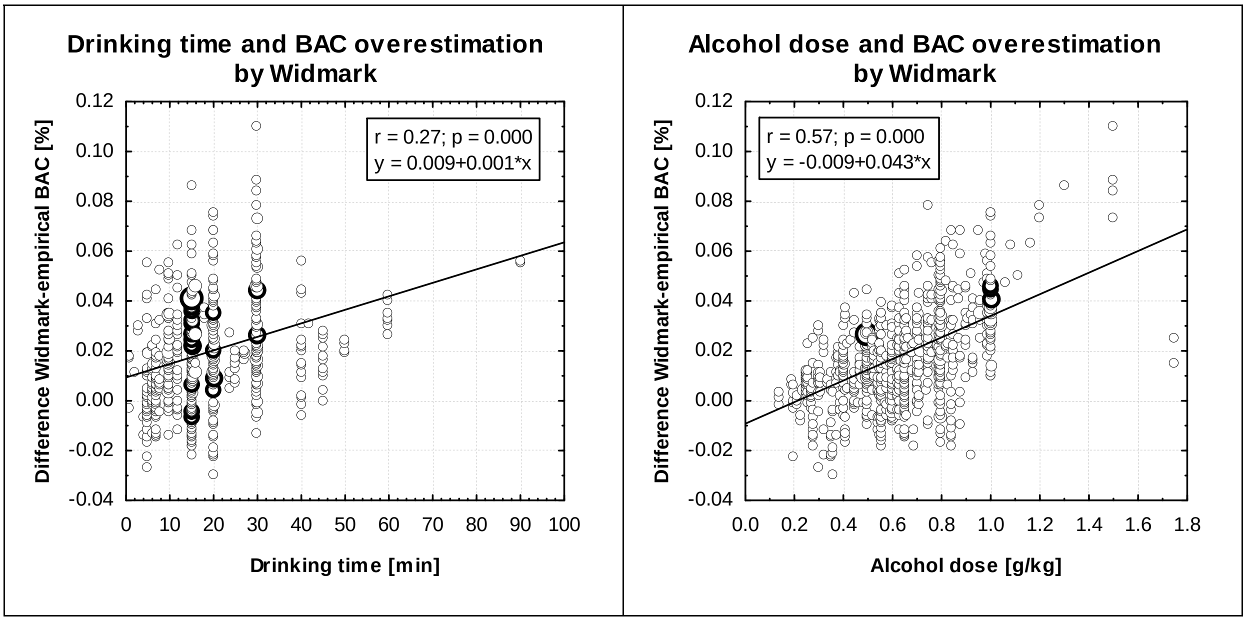


Figure 28: Correlation between the drinking time and the BAC overestimation by Widmark (left), and between the alcohol dose and the BAC overestimation (right) – the size of the points symbolises the frequencies.

As a consequence, when the empirical BAC is missing in the studies it was decided to take the target BAC, and only if this is not reported then the BAC calculated by Widmark is used. In 4% of the findings the target BAC is taken for the analysis, and in 14% the Widmark BAC.

Since, in general, the actual BAC is lower than the BAC calculated by Widmark (see above), the percentage of significant findings might be underestimated for the real BAC. If, for example, the BAC group 0.08% includes some BACs calculated by Widmark which are overestimated by 0.02% (so in fact the BAC is 0.06%), there might be fewer significant findings. The assumption that the percentage of significant findings is lower when including the Widmark BACs than when excluding them is confirmed, even though the difference is very small (see Figure 29).

[12] One outlier with a drinking time of 180 minutes is excluded. Otherwise the correlation would be even lower (r = 0.17).

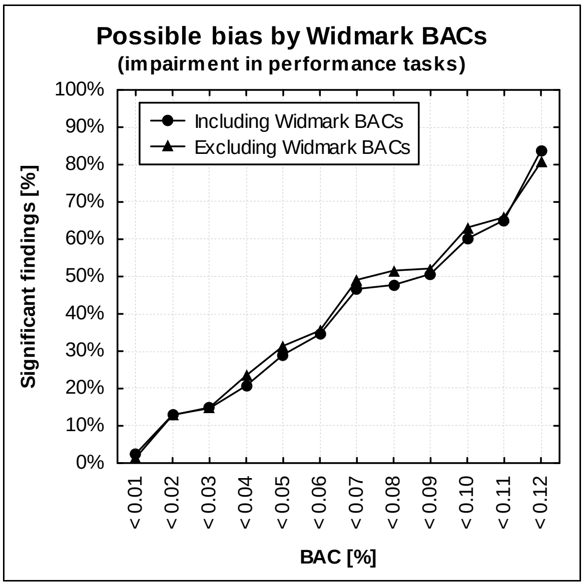


Figure 29: Percentage of significantly impaired findings per BAC group including BACs calculated by Widmark and excluding, respectively.

4.2.6 Statistical aspects

In this chapter statistical aspects of the studies are considered in order to check their influence on the results regarding performance under alcohol by introducing a quality index according to the methodological standards of the studies.

4.2.6.1 Description of the analysed studies

Table 12 shows the statistical data concerning the experimental design of the 450 publications and the 471 studies reported in them. For variables which might differ within one study (like alcohol dosage, BAC value, testing time) the descriptive statistics refer to the 5300 findings. Since every piece of information is not always reported, the statistics sometimes refer to fewer studies or findings. For interval-scaled variables the mean, standard deviation, median, range and number of studies or findings are presented. For nominal-scaled variables the absolute and relative frequencies are given. The variables are explained more in detail in the appendix (see Chapter 8.1.1 for the study variables and Chapter 8.1.2 for the finding variables).

Table 12: Statistical data for the variables of studies and findings, respectively.

A. INTERVAL-SCALED VARIABLES					
Study variables	**M**	**SD**	**Md**	**Range**	**N**
Sample					
- Number of subjects	32.6	41.0	20.0	4-400	471
- Number of female subjects	8.1	17.4	0	0-166	451
- Number of male subjects	24.7	33.1	13.5	0-400	452
- Mean age	25.4	4.7	24.0	19-53	303
Number of findings	11.2	21.0	6.0	1-350	471
Finding variables	**M**	**SD**	**Md**	**Range**	**N**
BAC [g/100ml]					
- Target BAC	0.07	0.02	0.07	0-0.15	1130
- Widmark BAC	0.07	0.03	0.07	0-0.21	4323
- Empirical BAC	0.06	0.02	0.06	0-0.17	4334
Alcohol dose [g/kg]	0.65	0.24	0.62	0.09-1.75	4804
Drinking time [min]	20.3	18.1	15.0	1-180	4544
Time till testing begins [min]	77.5	79.9	60.0	0-900	4828
Task duration [min]	11.7	16.0	5.0	1-123	2406

B. NOMINAL-SCALED VARIABLES		
Study variables	**N**	**%**
Main question	*471*	*100*
- single alcohol effect	176	37.3
- alcohol and drugs	111	23.6
- different dosages of alcohol	61	13.0
- other	41	8.7
- different subjects groups	34	7.2
- different points in time	31	6.6
- alcohol and sleep deprivation	17	3.6
Gender	*471*	*100*
- only male	236	50.1
- mixed	206	43.7
- only female	17	3.6
- not specified	12	2.6
Drinking group	*471*	*100*
- social drinkers	381	80.9
- not specified	80	17.0
- heavy drinkers	9	1.9
- binge drinkers	1	0.2
Driver group (only for driving studies)	*76*	*100*
- amateur (from the general public)	56	73.7
- professional	14	18.4
- not specified	5	6.6
- novice	1	1.3

Study variables	**N**	**%**
Selection processing	*471*	*100*
- on inquiry	181	38.4
- lab parameters	128	27.2
- not specified	88	18.7
- medical screening	63	13.4
- others	11	2.3
Methodological design (factors)	*471*	*100*
- >1 factor & interaction	251	53.3
- 1 factor	202	42.9
- >1 factor & no interaction	13	2.8
- others	5	1.0
Methodological design (levels)	*471*	*100*
- >2 levels & post hoc	248	52.7
- 2 levels	181	38.4
- >2 levels & no post hoc	37	7.9
- others	5	1.0
Standardisation of meals	*471*	*100*
- instruction	250	53.1
- standardisation	111	23.6
- not specified	92	19.5
- no standardisation	18	3.8
Blinding	*471*	*100*
- single blind	184	39.1
- double blind	175	37.2
- no	108	22.9
- not specified	4	0.8
Control group	*471*	*100*
- placebo	359	76.2
- non-alcohol	65	13.8
- no	47	10.0
Variance test for homogeneity	*471*	*100*
- not specified	457	97.0
- yes	11	2.3
- no	3	0.7
Randomising	*471*	*100*
- without relevance	308	65.4
- yes	133	28.2
- not specified	23	4.9
- no	7	1.5
Multivariate testing	*471*	*100*
- no	432	91.7
- yes	39	8.3
Non parametric testing	*471*	*100*
- no	458	97.2
- yes	13	2.8

Study variables	**N**	**%**
Repeated measures	*471*	*100*
- yes	375	79.6
- no	96	20.4
Confounding time (with alcohol effects)	*471*	*100*
- no	392	83.2
- yes	79	16.8
Alpha adjustment	*471*	*100*
- not specified	416	88.3
- yes	48	10.2
- no	7	1.5
Finding variables	**N**	**%**
BAC group	*5300*	*100*
- 0.050-0.079	1972	37.2
- ≥0.080	1502	28.3
- 0.030-0.049	1001	18.9
- 0.001-0.029	825	15.6
Type of parameter (only for performance tasks)	*2967*	*100*
- speed	969	32.7
- accuracy	1567	52.8
- speed & accuracy	369	12.4
- other	62	2.1
Training of the task (only for performance tasks)	*2971*	*100*
- yes	2271	76.4
- not specified	424	16.0
- no	232	7.6

The table shows that the total **sample size** is rather small with a median of 20, but about 80% of the studies use a **repeated measurement** design, which compensates for this deficit. The **selection process**, this means the checking whether the subjects fulfill the in- and exclusion criteria of the study, is mostly done on inquiry, only about one quarter of the studies uses lab parameters. The **mean age** of the subjects is 25 years (md = 24 years), and half of the studies give alcohol **only to men**, who are in the majority of cases **social drinkers**. The mean administered **alcohol dose** is 0.65 g/kg and it varies from 0.09 to 1.75 g/kg. This illustrates different investigative questions: extremely low quantities test whether and which alcohol effects are readily observable. In contrast, an extremely high dosage of alcohol tests which alcohol effects are still observable after a long period of alcohol elimination (up to 16 hours). **Drinking time** is rather brief with a median of 15 minutes. This means that a 75-kg-man has to drink on average 49 g pure alcohol in 15 minutes, which corresponds approximately to 1.25 liter beer or to 0.6 liter wine. The range of the **BACs estimated by using the Widmark formula** is higher (0-0.21 g/100ml) than that of the **empirically measured BACs** (0-0.17

g/100ml) and that of the **target BACs** (0-0.15 g/100ml). In general, the empirical BAC is 0.01 g/100ml lower than the BAC estimated with Widmark or the target BAC: the mean BAC values of all findings are 0.06 (empirically) or 0.07 g/100 ml (Widmark and target).

Time between the end of alcohol drinking and the beginning of measurement varies considerably from 0 to 900 minutes with a median of 60 minutes. This median value empirically supports the criterion for differentiating between the absorptive and eliminative phase which is set to 60 minutes. Thus, half of the studies investigate the effects of alcohol in the eliminative phase. The **duration of tasks** is on average 5 minutes (median), so only few studies investigate the effects of alcohol by long lasting tasks. In 76% of the performance findings the **task is trained** before testing in order to avoid learning effects. Regarding the **type of the measured parameter** more than half of the findings (53%) refer to accuracy in contrast to one third which refers to speed, this means the evaluation is rather error-related. Driving tests are mainly investigated with **drivers from the general public** (74%), and 77% of the studies **standardised meals** or gave an instruction what to eat before the test session. The **main question** refers mostly (37%) to the single effect of alcohol, and in 24% of the studies the combination of alcohol and other substances is of interest.

Referring to the **methodological design**, in 53% of the studies more than one factor is used and interactions are tested. In the same percentage of studies the factor has more than two levels and post hoc tests are conducted. For fully complete entries in the database post-hoc tests are essential in the case of more than two BAC levels (including placebo) or two testing time points. In 76% of the studies there is a placebo **control group** and the application of alcohol is single or double **blind**. Of the 35% studies in which a between-subject design is used, 80% assign the subjects **randomly** to the alcohol condition. In 17% there is a **confounding of time**, this means there are more than two testing time points and no alcohol-placebo comparison at every time point. A **multivariate** analysis is conducted in 8% of the studies and in 3% a non-**parametric** test. Only 3% specify whether they tested the **homogeneity of variances** and 90% performed no **adjustment of the α-level** for the number of statistical tests, even the maximum of **findings of effects** is 350 in one study[13] and the mean number of findings per study is 11.

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[13] At least in this study an alpha adjustment was performed. Moreover, 314 of the 350 findings refer to subjective parameters like e.g. “unpleasant physical sensations” or “pleasure”, so that there is no bias of the performance findings.

Moreover it has to be criticised that sometimes in the studies relevant data is missing (see Figure 30). Even though the studies are well selected, in 13% the administered alcohol dosage is not reported. The same holds true for the time between the administration of alcohol and the beginning of the test. In 14% of the studies the BAC is either not measured or at least not reported, and in 17% the drinking time is missing. 25% of the studies with performance findings do not report the duration of all tasks.

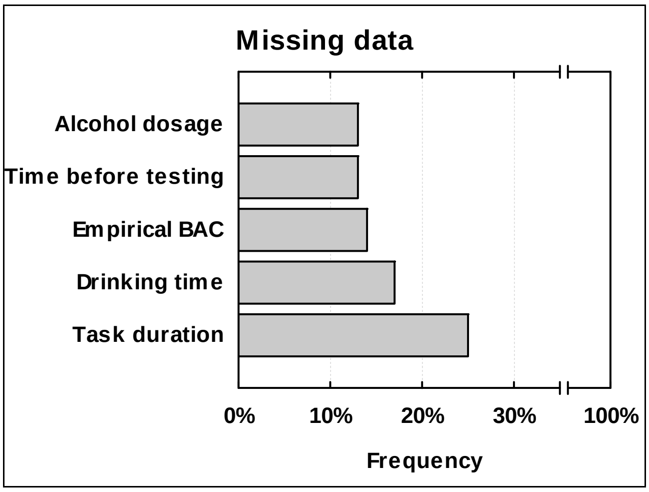


Figure 30: Frequencies of studies with missing data.

4.2.6.2 Quality index

The database contains a lot of variables which describe the methodological standard of the studies and their findings. Despite strong inclusion and exclusion criteria when selecting the studies for review (see Chapter 2.1), the remaining literature material is of varying quality. Table 13 gives a list of criteria to evaluate the methodological strength of a study. The first 12 criteria describe the quality of the study and the last 4 ones describe the quality of the reported finding. A rough estimate of the study and finding quality is given by the sum of bonus points.

Table 13: Criteria for the quality of a study or finding.

		Criteria (variables of the database)[14]	Specifications[15]	Points
STUDY QUALITY	1	Number of subjects	N < 10	0
			10 ≥ N < 20	0.5
			N ≥ 20	1
	2	Selection processing	On inquiry	0.5
			Medical screening/others	1
			Lab parameters	1
	3	Drinking group	Social drinkers	1
			Heavy drinkers	0
			Binge drinkers	0
	4	Meals before alcohol intake	No standardisation	0
			Instruction	1
			Standardisation	1
	5	Control group	No (baseline comparison)	0
			Non alcohol	0.5
			Placebo	1
	6	Methodological design	No post hoc test	0
			Post hoc test	1
	7	Alpha adjustment	No	0
			Yes (Bonferroni/others)	1
	8	Randomising	No	0
			Yes	1
	9	Confounding time (with alcohol effects)	No	1
			Yes	0
	10	Alcohol dose	Reported	1
	11	Drinking time	Reported	1
	12	Testing time	Reported	1
FINDING QUALITY	1	Training of the task	No	0
			Yes/not necessary	1
	2	Confidence of effect (interactions)	Low	0
			Medium	0.5
			High	1
	3	Estimation of effect	No (effect clearly described)	1
	4	BAC	Widmark	0
			Target	0
			Empirical	1

[14] The variables and their specifications are explained in detail in the appendix (see Chapter 8.1).
[15] If no specification is possible because of missing information in the study, zero points are given.

Since after reading the selected literature, 12% of the studies were already excluded because of methodological issues, it can be assumed that the quality of the studies and their findings is rather high. This is confirmed by a left-skewed distribution of the quality indices (see Figure 31).

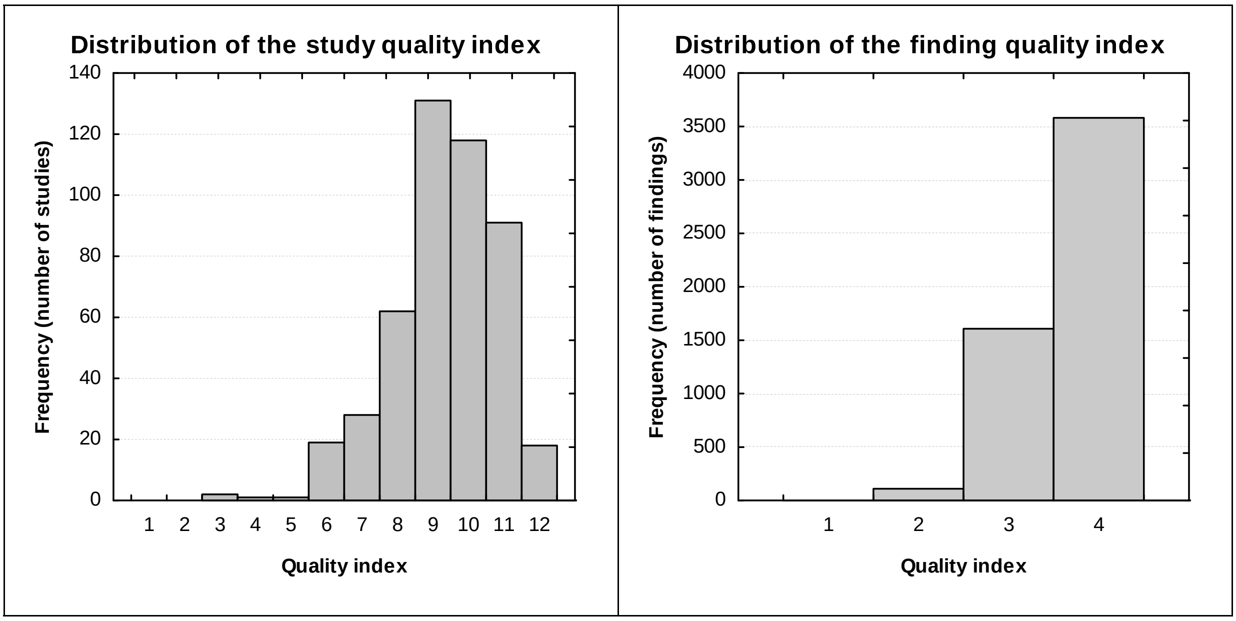


Figure 31: Distribution of the study quality index (left) and of the finding quality index (right).[16]

In a next step both indices are combined, and findings with a lower quality index than 3 or which belong to a study with a lower quality index than 8 are excluded. From the 2983 findings concerning performance tests, 547 findings are sorted out according to these criteria. Figure 32 compares the impairment function for all findings with the function obtained for the 2436 findings of high methodological quality. There are no obvious differences. Evidently, the selection criteria for being accepted for this meta-analysis have been so strong that only well controlled studies passed. This is supported by the fact that nearly all studies have a quality index of 6 or more points (see Figure 31, left).

[16] Uneven index values are part of the next higher category, e.g. 7.5 is comprised in 8.

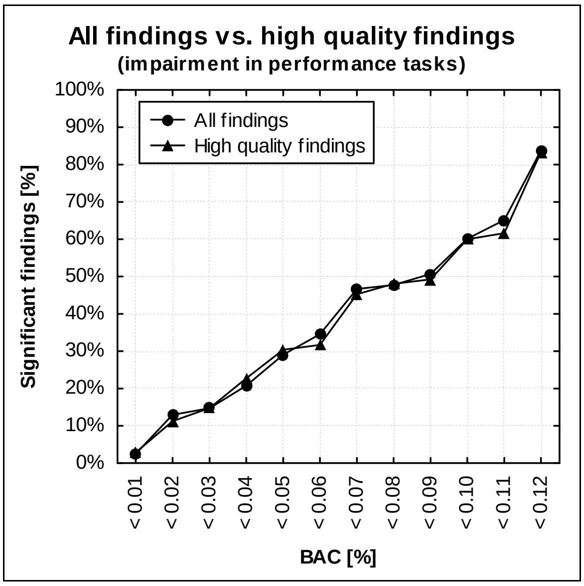


Figure 32: Percentage of significantly impaired findings per BAC group depending on the quality of studies and findings.

4.3 Consequences for further evaluation

This chapter checked whether the alcohol effects reported in the studies are affected by other variables or experimental conditions. As shown in the studies with a multi-factorial design, the effects of alcohol are not much influenced by other factors. An influence of drinking conditions was found, but is small enough to be neglected in the further evaluation. The same holds true for the kind of BAC estimation, although the real BAC is overestimated by the Widmark BAC. Despite the fact that alcohol is known to have different effects in the two phases of metabolism, no systematic difference could be identified, even if 20 minutes are taken as duration of the alcohol absorption. Apparently, the acute tolerance effect cannot be confirmed by means of a meta-analysis, as there are so many heterogenous studies combined with different individuals, alcohol dosages, drinking times and performance tasks, for example. Thus, this report does not introduce the phase distinction as a factor for describing the findings.

What also became apparent is that the calculation of effect sizes gives no additional information, since the results are not very clear. This might be due to the fact that very often the necessary parameters for calculating are missing, so that the number of effect sizes is small. Finally, the introduction of a quality index according to the methodological standards of the studies does not make any difference regarding the results. This is a consequence of the strict selection of the studies, which accounts for a generally high quality of the findings.

In summary, the methodological approach of a meta-analysis results in an impairment function which is only slightly moderated by additional variables. As a consequence, in the following analyses all gathered findings are included.

5 RESULTS: META-ANALYSIS OF ALCOHOL EFFECTS

5.1 Results for the function-oriented classification system

The raw data referring to the main and subcategories are presented in Table 17 in the appendix (see Chapter 8.2) where the frequencies of significant impairing effects per BAC group and category are listed. For the performance categories the main interest of the researchers lies in alcohol concentrations between 0.03% and 0.09%. For mood subcategories the frequencies of investigated BACs are nearly equally distributed within the range from 0.01 to 0.11% BAC. Generally, the number of impairing effects increases with increasing BAC. However, the single performance categories are differently sensitive to the effects of alcohol (some show an effect very early, i.e. with low BACs, and some rather late).

5.1.1 Subjective impairment

The mood subcategory *subjective intoxication* is the category with the greatest effect (Figure 33). The feeling of intoxication already increases at very low BACs, for example at a BAC of 0.04% 80% of the findings show a significant effect. With higher BACs subjects feel significantly more intoxicated than the control group without alcohol in almost every finding. Obviously the feeling of intoxication increases logarithmically with increasing BAC which may be explained by a ceiling effect.

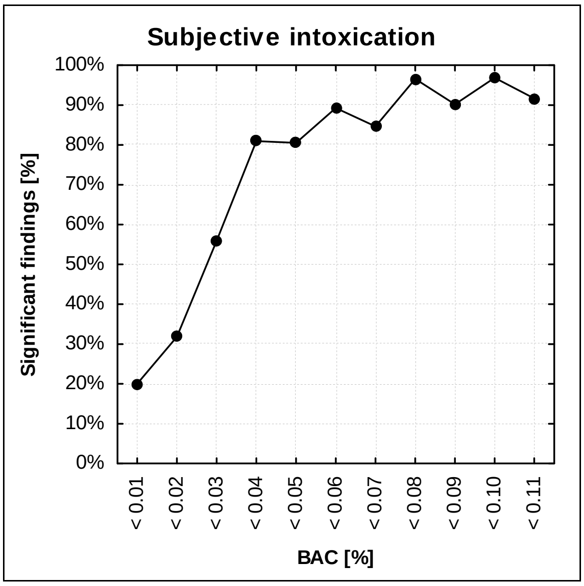


Figure 33: Subjective intoxication – percentage of significant findings per BAC group.

For the subcategory *subjective fatigue* the percentage of significant findings increases nearly linearly (Figure 34). With increasing BAC more and more findings reveal a significant alcohol effect on fatigue – for example at a BAC of 0.08% every second finding. This means that the subjective feeling of fatigue rises more slowly with increasing BAC than the feeling of intoxication.

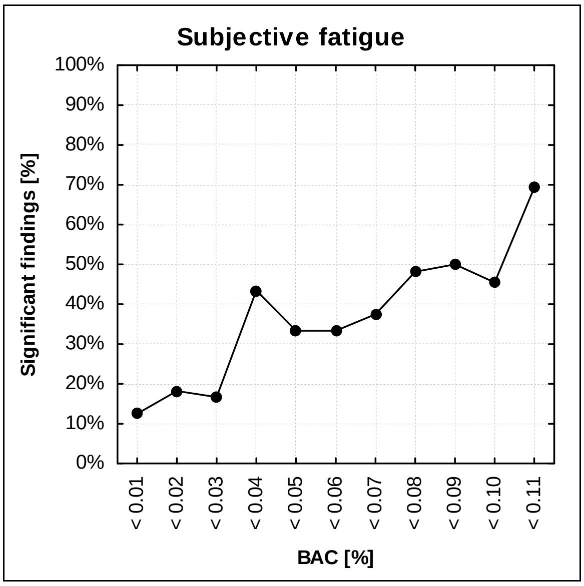


Figure 34: Subjective fatigue – percentage of significant findings per BAC group.

5.1.2 General objective impairment

In Figure 35 the percentage of significant findings for all performance categories is presented. Since this percentage increases to the same degree as the BAC, a linear function is fitted to the empirical values of the general performance data. The general impairment function comprises 2914 performance findings. At a BAC of 0.05%, 30% of the findings are significant, while at a BAC of 0.08% about 50% of the findings are significant. With every BAC group the percentage of significant findings increases by 6.6%.

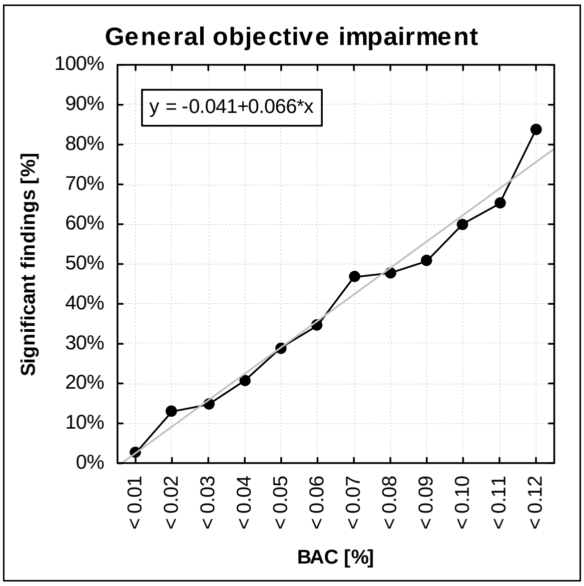


Figure 35: General objective impairment (regarding all performance categories) – percentage of significant findings per BAC group.

The substantial relevance of the general impairment function requires a closer look at its origination. If, for example, a performance category, which is already impaired by a low BAC, is overrepresented in low BAC groups, the general impairment will be overestimated. However, the distribution of the frequencies between the BAC groups is similar for all performance main categories (Figure 36). Most of them are mainly investigated with a BAC between 0.05% and 0.08%. This means that the general impairment function is not affected by category-specific frequency distributions.

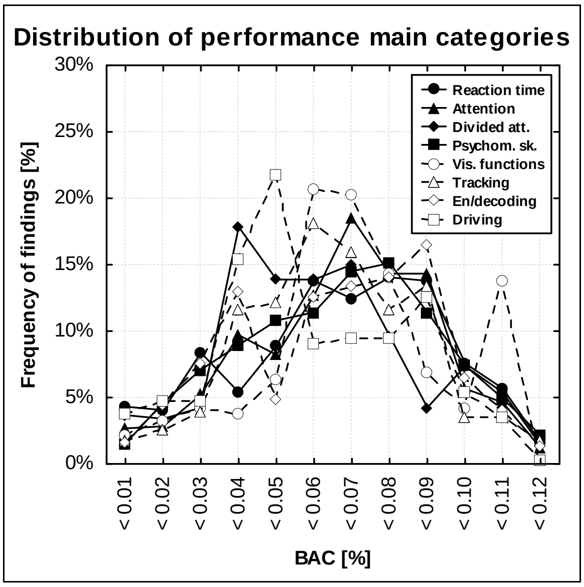
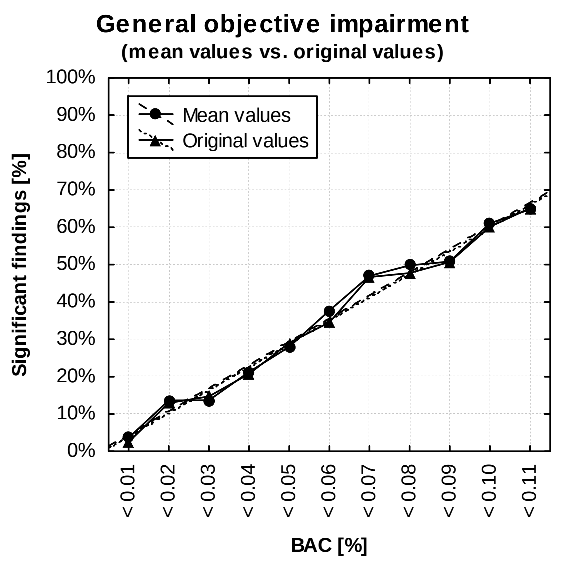


Figure 36: Distribution of performance main categories according to BAC group.

A second test regarding the representativeness of the general impairment function has to be conducted, since some performance categories are investigated more frequently than others, for example attention is studied more often than visual functions and tracking (see Chapter 3.3.1, Figure 8). It has to be determined whether this fact influences the result when aggregating the single performance categories into a general performance measure. To guarantee that each performance category is represented with the same weight in the aggregated general performance measure, the percentage of significant findings is calculated for each BAC group and for each main category (provided that the number of findings is beyond 10). This procedure eliminates the effect of unequal number of findings. Averaging those percentages per BAC group yields Figure 37, in which the results are compared with those of the unadjusted procedure of Figure 35.



BAC [%]	% sign. findings – mean values	% sign. findings – original values
0.01	3.65	2.53
0.02	13.65	12.96
0.03	13.68	14.71
0.04	21.28	20.75
0.05	28.01	29.04
0.06	37.72	34.54
0.07	47.00	46.70
0.08	49.83	47.76
0.09	50.85	50.70
0.10	61.06	60.11
0.11	64.81	65.13

Figure 37: General objective impairment – percentage of significant findings according to the mean values of performance main categories[17] in comparison to the original values.

Obviously, there is no substantial difference between the two types of analyses. However, some of the mean values of the single categories could not be considered because of their doubtful reliability (too low number of findings, see Table 17). Therefore, we recommend taking the original values for comparing the effects of alcohol with those of drugs and medicines.

[17] Regarding the main category "visual functions" only the performance subcategories "eye movements" and "complex perceptual functions" are considered, not the physiological ones.

5.1.3 Psychological functions

The impairment functions for the single main and subcategories (listed in Figure 8 and Figure 9) can be taken from Table 17 in the appendix. In order to get a more global view, three combinations of main categories and/or subcategories are composed with the headings “motor vs. cognitive”, “simple vs. complex” and “automatic vs. controlled”. For the dimension **motor functions,** the main categories *reaction time*, *psychomotor skills*, *tracking* and *driving* requiring basically psychomotor skills are aggregated, for **cognitive functions** the main categories *attention*, *divided attention*, *visual functions* and *en-/decoding.* Psychomotor functions are earlier impaired than tasks with cognitive demands (Figure 38). With a BAC of 0.05% there are almost twice as many significant findings for psychomotor functions.

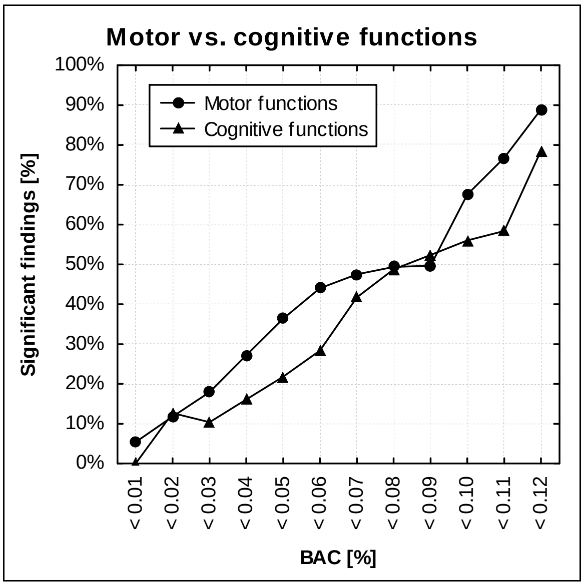


Figure 38: Impairment (motor vs. cognitive functions) – percentage of significant findings per BAC group.

A second traffic-relevant distinction is whether the performance task is a **simple or a complex** one. Tasks in the subcategories *simple reaction time*, *other attention tests* and *posture* are regarded as simple. *Visual functions* and *memory* are omitted, because they do not exactly fit with the categories *simple* or *complex.* Tasks in all the other performance subcategories are classified as complex. Figure 39 reveals that impairing effects of alcohol appear very early in complex tasks compared to simple tasks. At higher BACs, however, the number of significant findings does not differ.

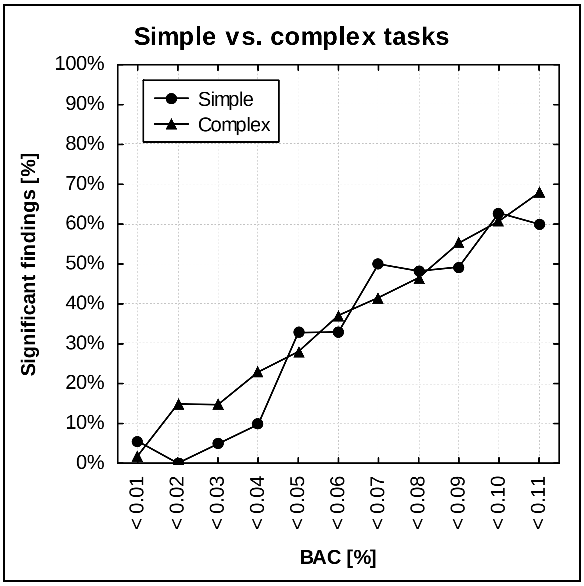


Figure 39: Impairment (simple vs. complex tasks) – percentage of significant findings per BAC group.

As a last distinction, the assignment to **automatic and control processes** by Krüger (1993) is applied. He refers to Schneider, Dumais & Shiffrin (1984) who classified actions in analogy to the functioning of computer systems into automatic and control processing. Automatic actions are characterised by the fact that they take place at very low awareness, with little effort and without making use of central functions. Control processes, in contrast, are characterised by high awareness, subjective effort and using a lot of central capacity. It is assumed that tasks in the subcategories *simple* and *choice reaction time* are characterized by automatic processes as well as *categorisation*, *cancellation*, *mental arithmetic*, *other attention tests* and *easy tracking*. Control processes comprise *hand-eye coordination*, *divided attention*, *difficult tracking* and *information processing* tests. *Posture*, *visual functions*, *memory* and *driving tests* are excluded from the assignment to automatic and control processes. Unlike the result in Krüger (1993) where performance in automatic processes could be sustained even with higher BACs, there is no clear difference between the two groups here (Figure 40). At least, control processes are slightly more affected by alcohol than automatic processes between a BAC of 0.05 and 0.10% and at some lower BACs (0.02 and 0.04%).

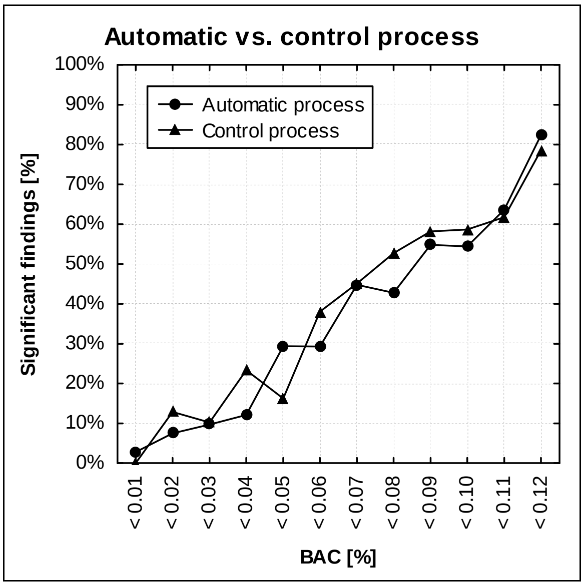


Figure 40: Impairment (automatic vs. control process) – percentage of significant findings per BAC group.

Additionally, a short overview of the percentage of significantly impaired findings regarding all performance main categories is given for a BAC around 0.05% (Table 14). Without going into too much detail, but to cover at least this most interesting BAC area, BAC levels between 0.040 and 0.059% are considered.

Table 14: Percentage of significantly impaired findings with a BAC around 0.05% per main category.

Performance main categories	Percentage of sign. findings (0.040-0.059% BAC)
Driving[18]	48%
Tracking	46%
Psychomotor skills	38%
Visual functions	33%
Reaction time	29%
En-/decoding	27%
Attention	24%
Divided attention	20%
General objective impairment	**32%**

Also when analysing the single performance categories, impairment with a BAC around 0.05% is found more frequently in categories which comprise psychomotor or complex tasks rather than cognitive or simple tasks. The percentage of significant findings is much higher e.g. in driving or tracking tasks than in attention tasks.

[18] The percentage of impaired findings for the subcategory "driving simulator" at BACs between 0.040 and 0.059% is 39% (see also Figure 41).

5.1.4 Driving impairment

As traffic behaviour is the main issue of the study, a closer look is taken at the main category *driving*, which comprises the assessment approaches driving simulator, flight simulator and closed course. In order not to confuse these approaches, only the findings of the subcategory *driving simulator* are taken, which constitute two thirds of the main category (207 out of 317 findings up to a BAC of 0.11%). Figure 41 shows that the impairment function of driving simulator tasks increases relatively logarithmically up to 50% significantly impaired findings at the maximum. Unfortunately, there are few studies available, especially with low and high BACs (just around 10 findings per BAC group). If findings of the more demanding flight simulator and closed course tasks were integrated (not shown in the figure), the percentage of significant findings would be slightly higher (up to 59%). The figure reveals that in contrast to the general impairment function, the percentage of significant findings in driving simulator tasks is much higher with low BACs.

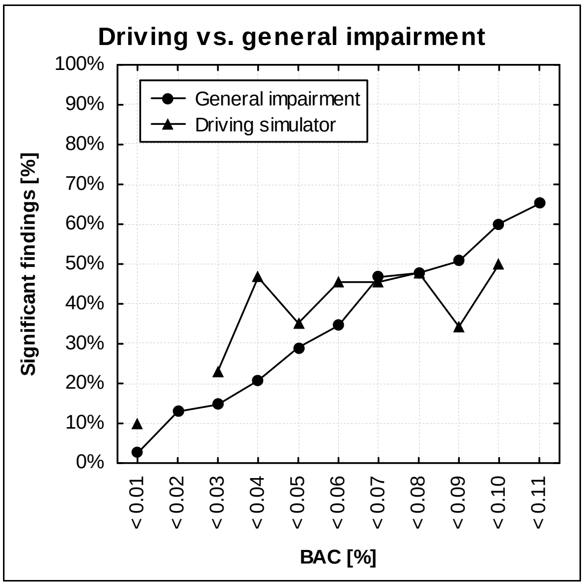


Figure 41: Impairment in driving simulator tasks vs. in general – percentage of significant findings per BAC group.

The underestimation of driving impairment by the general impairment function at low BACs is quite plausible, since a driving simulator task is more complex than most of the laboratory tasks. As it was demonstrated in Chapter 5.1.3, complex tasks are more affected by alcohol than simple tasks especially at low BACs. Moreover, the driving performance in simulator tasks is mainly represented by parameters measuring motor skills (e.g. the standard deviation of lateral position or reaction times), which are impaired sooner than cognitive skills (see also

Chapter 5.1.3). In order to find an explanation for the only slight increase of 5% from a BAC of 0.06% to higher intoxications, the driving studies are looked at more precisely.

First, the simulator driving tasks are analysed regarding their complexity. If with increasing BAC the complexity of tasks decreases, the percentage of impaired findings might not increase. Four different types of driving tasks were identified in the studies:

- Road tracking: main parameters standard deviation of lateral position, off-road incidents, speed, speed variability
- Car following: main parameters headway, coherence, time-to-collision, collisions
- Complex driving tasks (e.g. complex scenarios, difficult conditions, secondary task or speed component): main parameters errors, time
- Hazard perception tasks: main parameters reaction time, brake latency

The first two types of driving tasks are classified as simple, the last two types as complex. Figure 42 reveals that low BACs up to 0.05% are mainly investigated with complex tasks, whereas at BACs between 0.06 and 0.08% simple tasks predominate. This result might contribute to the early increase of impaired driving findings and also to the constant percentage of impairment afterwards.

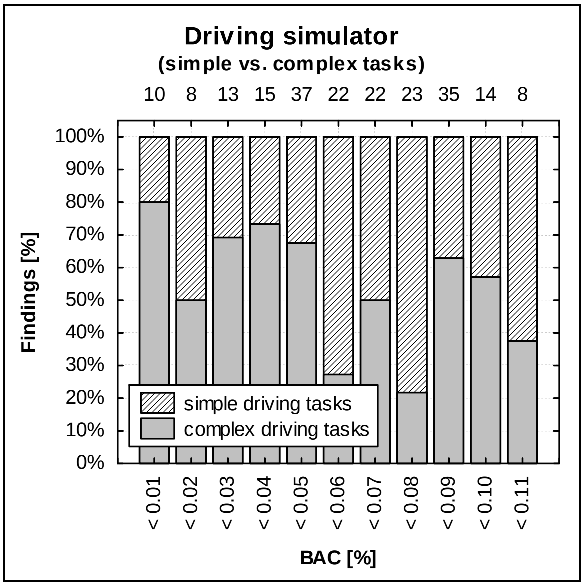


Figure 42: Percentage of simple vs. complex driving simulator tasks findings (on top the number of findings per BAC group is presented).

Second, the simulator driving tasks are analysed regarding the age of the subjects. Mayhew, Donelson, Beirness and Simpson (1986) stated in their review that young drivers have a greater risk of crash involvement than older drivers at all BACs. This finding is attributed in part to a lack of driving experience. Moreover, young drivers are inexperienced not only in driving, but also in drinking and in combining these two activities. When looking at the subjects' age, it is striking that at low BACs there are many more findings with young drivers, whereas at high BACs findings with drivers older than 24 years are in the majority (Figure 43). Subjects in the 0.09% BAC condition are on average 13 years older than subjects in the 0.06 BAC condition (36 vs. 23 years). Thus, it can be assumed that – besides the decreasing complexity of driving tasks – older drivers are responsible for the only slight increase of impairment at higher BACs.

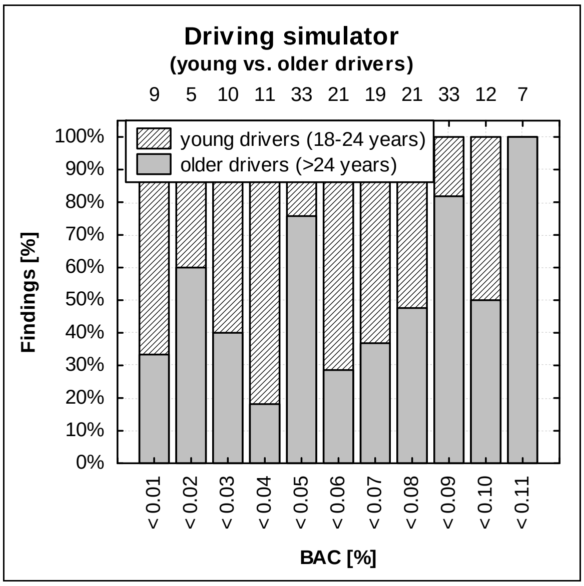


Figure 43: Percentage of young vs. older drivers in driving simulator tasks findings (on top the number of findings per BAC group is presented).

5.2 Results for the process-/task-oriented classification system

The raw data for the process-/task-oriented classification system are presented in Table 18 in the appendix (see Chapter 8.3) where the frequencies of significant detrimental effects per BAC group and subdimension are listed.

In the process-/task-oriented classification system every finding is classified on each of the 14 dimensions. Thus, the significance of one finding (e.g. referring to a choice reaction time task) will contribute to the impairment functions of all subdimensions to which the task is assigned, for example to the impairment function of (1) *feature extraction* (stage of information processing), (2) *alertness* (type of attention), (3) *simple* (motor complexity), etc.

5.2.1 Impairment concerning the process model

Firstly, the different stages of information processing are examined (Figure 44). In fact, up to two stages were classified for every task, but percentages here refer to the subdimensions of the primary stage where the main focus of the task lies. For a better overview the single BAC groups are combined into four groups.

Feature extraction and *reaction planning* work quite well up to a BAC of 0.05%, whereas *sensory perception*, *operational* and *motor processes* are already impaired with low BACs. In tasks with a focus on *motor output* the percentage of significantly impaired findings reaches the highest point with increasing BACs. Findings assigned to the subdimensions *active search* and *decision* are too few to present.

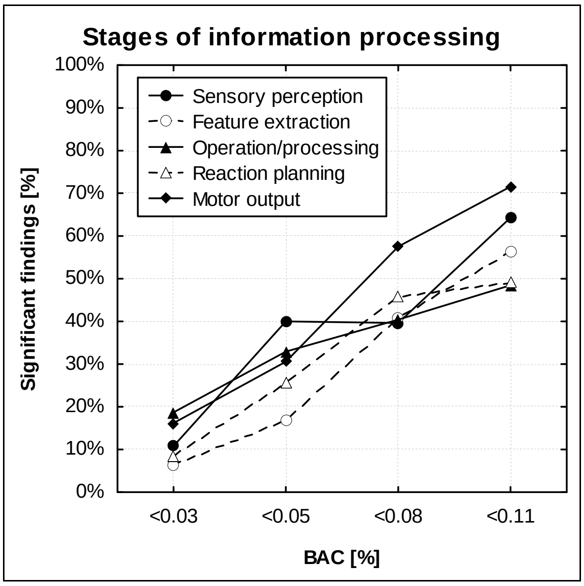


Figure 44: Percentage of significantly impaired findings for four combined BAC groups according to the stages of information processing of the task.

5.2.2 Impairment concerning the task-oriented dimensions

Below, the most interesting results concerning the task-oriented dimensions are presented. Differences in impairment become obvious depending on the type of attention (Figure 45). Almost no studies find a detrimental effect in tasks which require short-term *alertness* up to a

BAC of 0.04%. In contrast, impairment can be found a bit earlier from a BAC of 0.04% and upwards in *sustained attention* tasks, and especially in *vigilance* tasks the percentage of significant findings is rather high. Unfortunately, there are not enough findings assigned to the subdimension *vigilance* in the very low or high BAC groups.

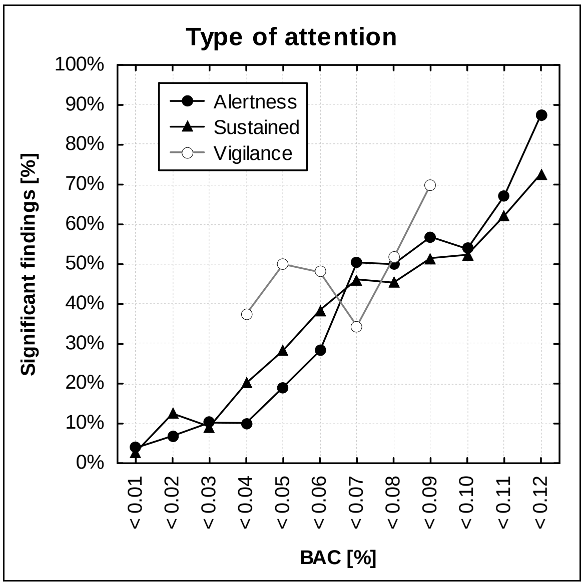


Figure 45: Percentage of significantly impaired findings per BAC group according to the type of attention.

Impairment differs as well depending on the dynamics of the task. Compared to *static* tasks the percentages of significant findings are much higher in *dynamic* tasks (like driving), in which impairment already becomes evident with very low BACs.

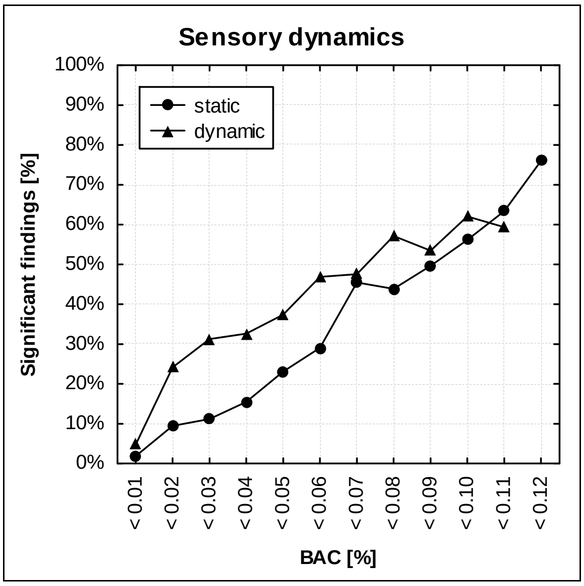


Figure 46: Percentage of significantly impaired findings per BAC group according to the sensory dynamics.

Moreover, impairment differs according to the motor complexity of a task. The higher the motor complexity, the higher the percentage of significantly impaired findings is, especially with high BACs (Figure 47).

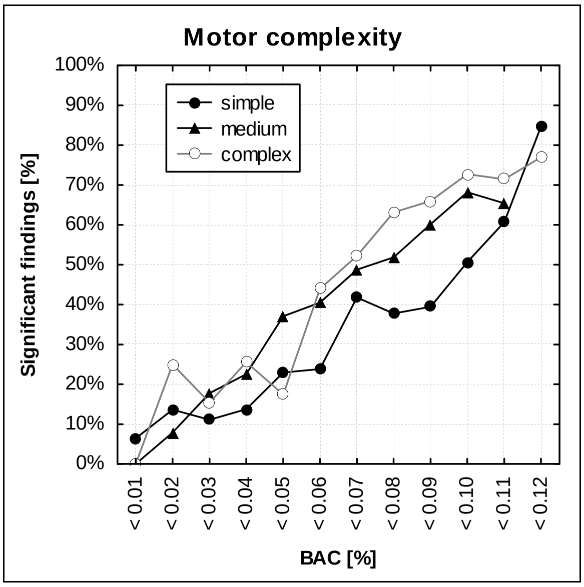


Figure 47: Percentage of significantly impaired findings per BAC group according to the motor complexity.

The following table gives an overview of the results including the not graphically presented dimensions for four combined BAC groups.

Table 15: Percentages of significantly impaired findings for four combined BAC groups concerning the task-oriented dimensions.[19]

Dimensions and subdimensions	**Percentages of significantly impaired findings per BAC group**			
	0.001-0.029%	**0.030-0.049%**	**0.050-0.079%**	**0.080-0.109%**
Type of attention (see Figure 45)				
Alertness	8%	15%	43%	59%
Sustained	9%	24%	44%	54%
Vigilance	53%	43%	45%	73%
Task combination				
Single – discrete	9%	19%	41%	55%
Single – continuous	20%	34%	52%	65%
Double – 2x discrete	8%	6%	20%	29%
Double – discrete & continuous	9%	36%	53%	59%
Task pace				
Self paced	16%	23%	45%	59%
Task paced	9%	26%	43%	51%

[19] Missing subdimensions or empty cells mean that the frequency of findings is below 10.

Kind of stress				
Speed	10%	37%	41%	44%
Accuracy	19%	30%	43%	60%
Speed & accuracy	7%	19%	38%	56%
Stress level				
Low	15%	24%	45%	58%
Medium	12%	27%	41%	56%
High	7%	22%	44%	56%
Sensory modality				
Visual/spatial	12%	26%	44%	57%
Auditory	5%	14%	34%	44%
Vestibular	0%	33%	67%	94%
Type of information				
Formal/abstract	11%	25%	43%	56%
Semantic	15%	27%	44%	50%
Sensory dynamics (see Figure 46)				
Static	9%	19%	40%	54%
Dynamic	22%	35%	50%	57%
Operation level				
Skill	14%	32%	51%	65%
Rule	10%	17%	37%	51%
Knowledge	-	21%	52%	47%
Memory				
Short term memory	19%	21%	36%	46%
Long term memory	28%	40%	57%	42%
Memory recall				
Recognition	16%	15%	25%	44%
Cued recall	-	-	54%	37%
Free recall	42%	53%	67%	49%
Motor complexity (see Figure 47)				
Simple	11%	18%	35%	47%
Medium	10%	30%	47%	63%
High	15%	22%	53%	70%

When looking at the dimension “task combination”, the table reveals that it is more crucial for the impairment if the task is continuous than if there is a secondary discrete task to perform. The fact that there are less significant findings for a double discrete task than for a single discrete task is remarkable. This is likely due to the much lower number of findings regarding double discrete tasks (191 findings in contrast to 803 findings with single discrete tasks) which leads to a lower reliability. Moreover, the table reveals that impairment does not depend much on the "task pace" nor on the "stress level" or the "type of information". Within these dimensions the percentages of impaired findings hardly differ regarding the subdimensions. The instruction to perform the task as *accurately* as possible goes along with higher percentages of significantly impaired findings compared to tasks which emphasises *speed* or both parameters. The same holds true for tasks which concern the *vestibular* sense compared to *visual* or *auditory* tasks. Surprisingly, there are more significantly impaired findings when a task is *skill-based* than when it is *rule-based*. Finally, the types of memory are decisive for impairment, especially with lower or medium BACs. Tasks which require *long-term memory* or *free recall* are particularly impaired.

The last analysis does not refer exclusively to the process-/task-oriented classification, but generally to all performance findings regardless of the classification system. It considers the type of parameters that are evaluated in the studies. As already mentioned in Chapter 3.3.3, this variable is not to be confounded with the dimension "kind of stress" which refers to the instruction. Apparently, parameters concerning *speed* like reaction time are less frequently impaired than *accuracy* parameters like errors (Figure 48). With high BACs parameters considering *speed and accuracy* (e.g. number of errors in a given time) are most frequently impaired.

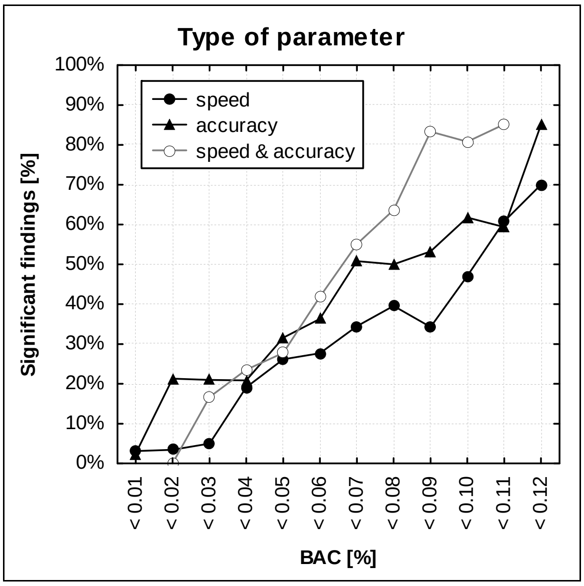


Figure 48: Percentage of significantly impaired findings per BAC group according to speed vs. accuracy parameters.

To summarize, clear differences in the impairment become obvious regarding some of the dimensions. There are dimensions in which impairment differs with low rather than with high BACs, and vice versa (see Table 16).

Table 16: Dimensions which differentiate with low BACs and/or with high BACs.

	<0.05% BAC		**≥0.05% BAC**	
Dimension	**Less frequently impaired**	**More frequently impaired**	**Less frequently impaired**	**More frequently impaired**
Stages of inf. proc.	Feature extraction Reaction planning	Operation Motor output	Reaction planning	Motor output
Type of attention	Alertness	Sustained attention Vigilance		
Sensory dynamics	Static	Dynamic		
Motor complexity			Simple	Medium Complex
Type of parameter			Speed	Accuracy Speed&accuracy
Tasks represented	CHOICE RT ATTENTION	DRIVING TRACKING	CHOICE RT ATTENTION	DRIVING TRACKING

Regarding the stages of information processing the subdimension *motor output* is more frequently impaired than *feature extraction* and *reaction planning* throughout all BAC levels. The dimension "type of attention" differentiates very well with low BACs below 0.05%, where *sustained attention* and *vigilance* are more frequently impaired than *alertness*. The same holds true for *dynamic* tasks where the percentage of significant findings is much higher than for *static* tasks, especially with low BACs. In contrast, the motor complexity of the task only has an influence on the impairment with high BACs above 0.05%. With high BACs impairment also depends clearly on the type of parameter. Significant findings occur more frequently if the measured parameter reflects *accuracy* or *speed and accuracy* (errors per time) than just *speed*. Thereby the subdimensions which are responsible for a high impairment mainly represent driving or tracking tasks, whereas the subdimensions responsible for a low impairment mainly represent choice reaction time or attention tasks.

To conclude, performance under alcohol differs strongly according to the type of performance task, this means impairment depends on the exact demands in a task.

6 DISCUSSION

This meta-analysis of the scientific literature on alcohol effects has two aims: (1) to provide a scientific base for estimating the impairing effect of alcohol on driving safety, (2) to provide a reference function for the impairing effect of other psychoactive substances.

In general, the methodological quality of alcohol research is quite high. Most studies use placebo control groups and are single or double blind. In the majority of cases the ingestion of food is standardized before the application of alcohol, which is randomised in between-subject designs. In most studies the tasks are practised. In addition to a global evaluation, most studies conduct post-hoc tests if there are more than two levels of the factor alcohol. However, the effects of alcohol are predominantly studied with rather small sample sizes consisting of young men who are social drinkers. Performance tests take place mainly in the eliminative phase and the task duration is quite short. Moreover, rather high quantities of alcohol have to be consumed at an unusual time of day in a short time, which does not correspond to normal drinking habits and conditions. Unfortunately, relevant information is often missing in the publications (e.g. the administered alcohol dosage, the time between the administration of alcohol and the beginning of the test, the duration of the test, the drinking time, the BAC, etc.). Additionally, the documentation of statistics like F-values, mean values or standard deviations is poor. The calculation of effect sizes was only possible for every third finding. In 68% of the findings of those studies which used a multi-factorial design, the impact of other factors on the alcohol effect could be determined. In the other one third of the findings interactions are not reported. Principally, the methodological requirements like placebo control groups or training of the task are in accordance with the guidelines for research on drugged driving developed by the International Council on Alcohol, Drugs and Traffic Safety's (ICADTS) working group (Walsh, Verstraete, Huestis & Morland, 2008). However, future investigations will have to pay more attention to the problem of missing information and should report the relevant information more carefully, regardless of the investigated substance.

To establish the general impairment function, all findings concerning performance were considered regardless of which driving-relevant skill was measured. 2913 findings related to BACs between 0.001 and 0.119% were included. The function is nearly linear with a slope of 6.6% (increment of significant findings) per 0.01% BAC and with about 30% significant findings at a BAC of 0.05%. Regarding the subjective feeling of fatigue, the function looks very similar with about 30% significant findings at 0.05% BAC as well. In contrast, the function for the subjective feeling of intoxication increases logarithmically with 80% significant findings at a BAC of 0.04%. At BAC levels where fatigue arises and performance starts to be impaired, subjects already feel considerably intoxicated (at least social drinkers, on which the study results are based). This means that subjective intoxication is an early indicator for impairment.

Moreover, the function-oriented classification reveals that psychomotor functions are more impaired than cognitive functions. With low BACs, performance in simple tasks is less impaired than in complex tasks. It seems that subjects are able to compensate if the demands are low. However, with higher BACs the impairing effects do not differ depending on the complexity of the task.

Performance in automatic processes does not differ systematically from performance in control processes. This does not support the result of Krüger (1993) who found that automatic processes are not as much affected as control processes even with high BACs. However, he only considered BACs up to 0.08%, and up to a BAC of 0.10% automatic processes are actually slightly less impaired (at least if a linear function is fitted).

The main categorie “driving” shows the highest impairment at BACs around 0.05% with 48% significant findings. Since this is much more than for all the other driving-relevant categories, driving tests are obviously essential for risk estimations concerning the effects of alcohol. Especially at low BACs, the general impairment function does not represent the driving performance. Impaired driving occurs much earlier than general impairment. This may be due to the fact that driving is a rather complex task with a predominance of those skills which are sensitive to alcohol.

The process-/task-oriented classification supports the result of the function-oriented classification that psychomotor skills are most impaired by alcohol. In contrast, tasks in which simply a reaction has to be initiated are much less impaired. Impairment is also low in tasks in which the relevant information of the stimuli has to be extracted, at least up to a BAC of 0.05%.

Particularly with low BACs, vigilance performance is much more impaired than performance in alertness or sustained attention tasks. In alertness tasks there is almost no detrimental effect up to a BAC of 0.04%, which corresponds to the results of simple tasks. At BACs above 0.06%, the frequencies of impaired findings are comparable for all kinds of attention.

Dynamic tasks like driving are much more impaired than static tasks and already at very low BACs, which corresponds to the result of the function-oriented classification system where driving is the most impaired category.

Furthermore, impairment correlates with the motor complexity of the task, especially at BACs above 0.05%. The higher the motor complexity of a task, the higher the percentage of significantly impaired findings is.

Impairment also differs for speed and/or accuracy parameters. Tasks in which reaction times and errors are considered simultaneously are most impaired, especially at BACs above 0.05%. The difference is up to 50% of significant findings compared to the single parameter of speed.

The impairment under alcohol clearly differs within most of the dimensions. There are dimensions which differentiate mainly at low BACs like attention type or task dynamics, or mainly at high BACs like motor complexity or the speed/accuracy distinction of the evaluated parameters. Especially with high BACs an exact complex motor reaction under time pressure is critical, whereas performing a dynamic vigilance task is already critical with very low BACs. This means performance under alcohol strongly depends on the characteristics and exact demands of a task.

The meta-analytic procedure determines for each BAC group how often significant effects were reported. Therefore, the percentage of significant results is only a descriptive measure. Interpreting these percentages as degrees of impairment is an interpretation going beyond the information from the data base. Even though this interpretation has high face validity, one must be aware of this limitation when using this information for practical purposes. Moreover, the impairment functions of single psychological functions and dimensions, a global impairment function was calculated, aggregating all results. This function is a collection of experimental studies using different tasks, dependent variables, instructions and test environments for example. Nonetheless, if nothing is known about the task and the person, this function (as an average) is the best estimate for alcohol-induced impairment. In the case that more information about the characteristic of the task or the person is available, more specific impairment functions should be used.

Furthermore, the impairment function is not a risk function. There is no direct way from an impairment level to an accident risk. The risk is constituted by an interaction of impairment with the demands of the driving situation and the individual abilities to compensate for the detrimental effects of alcohol. The question may arise why the risk function is exponential whereas the impairment function is strictly linear. Two reasons are conceivable. First, driving is a very special combination of subtasks, each with another impairment function. Therefore, the exponential shape of the risk function may be the result of a weighted aggregation of task-specific impairment functions. Second, driving under the influence of alcohol has severe legal consequences. Therefore, all drivers will try to compensate for the effects. This compensation may be successful at least for lower BACs, resulting in a slow increase of the risk, but breaks down with higher BACs. A more detailed answer requires a better understanding of the task profile of safe driving.

7 REFERENCES

Aron, A., Aron, E. N., & Coups, E. J. (2006). *Statistics for psychology* (4th ed.). Upper Saddle River, NJ: Pearson/Prentice-Hall.

Berghaus, G. (1997). *Arzneimittel und Fahrtüchtigkeit. Metaanalyse experimenteller Studien*. Bergisch Gladbach: Bundesanstalt für Straßenwesen.

Berghaus, G., Schulz, E., & unter Mitarbeit von Szegedi, A. (1998). Cannabis und Fahrtüchtigkeit. Ergebnisse der experimentellen Forschung. In G. Berghaus & H.-P. Krüger (Eds.), *Cannabis im Straßenverkehr* (pp. 73-98). Stuttgart: Fischer.

Bortz, J. (2005). *Statistik für Human- und Sozialwissenschaftler* (6 ed.). Berlin: Springer.

Brückner, M., Peters, H., & Sömen, H. D. (1988). *Testverfahren zur Überprüfung des Einflusses von Arzneimitteln auf die Verkehrssicherheit. Psychologischer Schwerpunkt*. Bergisch Gladbach: Bundesanstalt für Straßenwesen.

Griffiths, R. R., Bigelow, G. E., & Liebson, I. (1983). Differential effects of diazepam and pentobarbital on mood and behavior. *Archives of General Psychiatry, 40*(8), 865-873.

Hedges, L. V., & Olkin, I. (1980). Vote-counting methods in research synthesis. *Psychological Bulletin, 88*(2), 359-369.

Hiltunen, A. J. (1997). Acute alcohol tolerance in cognitive and psychomotor performance: Influence of the alcohol dose and prior alcohol experience. *Alcohol, 14*(2), 125-130.

Hockey, G. R. J. (1997). Compensatory control in the regulation of human performance under stress and high workload: A cognitive-energetical framework. *Biological Psychology, 45*(1-3), 73-93.

Holding, D. H. (1983). Fatigue. In G. R. J. Hockey (Ed.), *Stress and fatigue in human performance*. Chichester: John Wiley.

Huckenbeck, W. & Bonte, W. (2003). Alkohologie. In B. Madea & B. Brinkmann (Eds.), *Handbuch gerichtliche Medizin, Band 2*. Berlin: Springer.

Kalant, H. (1971). Absorption, diffusion, distribution, and elimination of ethanol: effects on biological membranes. In B. Kissin & H. Begleiter (Eds.), *The biology of alcoholism. Volume 1: Biochemistry* (pp. 1-62). New York: Plenum Press.

Krüger, H.-P., Kohnen, R., Diehl, M., & Hüppe, A. (1990). *Auswirkungen geringer Alkoholmengen auf Fahrverhalten und Verkehrssicherheit*. Forschungsbericht Nr. 213. Bergisch Gladbach: Bundesanstalt für Straßenwesen.

Krüger, H.-P. (1993). Effects of low alcohol dosages: A review of the literature. In H. D. Utzelmann, G. Berghaus, & G. Kroj (Eds.), *Alcohol, Drugs and Traffic Safety – T'92* (pp. 763-778). Cologne, Germany: Verlag TÜV Rheinland.

Madea, B., & Dettmeyer, R. (2007). *Basiswissen Rechtsmedizin*. Heidelberg: Springer.

Mayhew, D. R., Donelson, A. C., Beirness, D. J., & Simpson, H. M. (1986). Youth, alcohol and relative risk of crash involvement. *Accident Analysis & Prevention, 18*(4), 273-287.

Moskowitz, H., & Robinson, C. (1987). Driving-related skills impairment at low blood alcohol levels. In P. C. Noordzij & R. Roszbach (Eds.), *Alcohol, drugs and traffic safety - T86* (pp. 79-86). Amsterdam: Elsevier.

Moskowitz, H., & Fiorentino, D. (2000). A review of the literature on the effects of low doses of alcohol on driving-related skills. Washington, DC: National Highway Traffic Safety Administration (NHTSA).

Rasmussen, J. (1986). *Information processing and human-machine interaction*. New York: North-Holland.

Rosenthal, R. (1991). *Meta-analytic procedures for social research* (Vol. 6). Newbury Park: Sage.

Sanders, A. F. (1983). Towards a model of stress and human performance. *Acta Psychologica, 53*, 61-97.

Schneider, W., Dumais, S. T., & Shiffrin, R. M. (1984). Automatic and control processing and attention. In R. Parasuraman & D. R. Davies (Eds.), *Varieties in attention* (pp. 1-27). London: Academic Press.

Seidl, S., Jensen, U., & Alt, A. (2000). The calculation of blood ethanol concentrations in males and females. *International Journal of Legal Medicine, 114,* 71-77.

Staak, M., Hobi, V., & Berghaus, G. (1988). *Testverfahren zur Überprüfung des Einflusses von Arzneimitteln auf die Verkehrssicherheit. Medizinischer Schwerpunkt*. Bergisch Gladbach: Bundesanstalt für Straßenwesen.

Walsh, J. M., Verstraete, A. G., Huestis, M. A., & Mørland, J. (2008). Guidelines for research on drugged driving. *Addiction, 103*(8), 1258-1268.

Wickens, C. D. (1984). *Engineering psychology and human performance*. Columbus: Charles E. Merrill Publishing Company.

Widmark, E. M. (1932). *Die theoretischen Grundlagen und die praktische Verwendbarkeit der gerichtlich-medizinischen Alkoholbestimmung.* Berlin: Urban & Schwarzenberg.

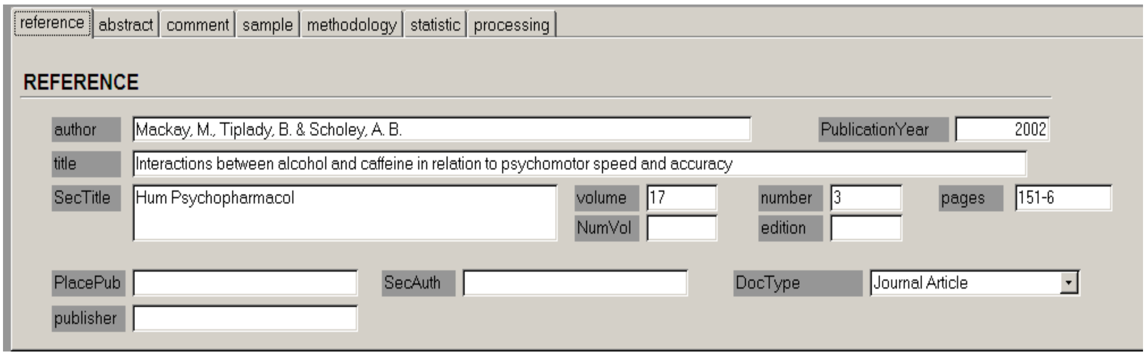
Wirtz, M., & Caspar, F. (2002). *Beurteilerübereinstimmung und Beurteilerreliabilität*. Göttingen: Hogrefe.

8 APPENDIX

8.1 Detailed description of the database

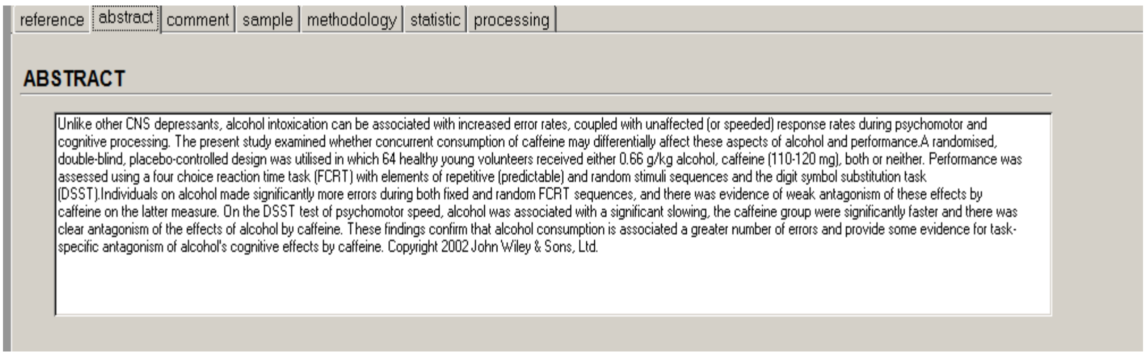
8.1.1 Publication level

8.1.1.1 Reference



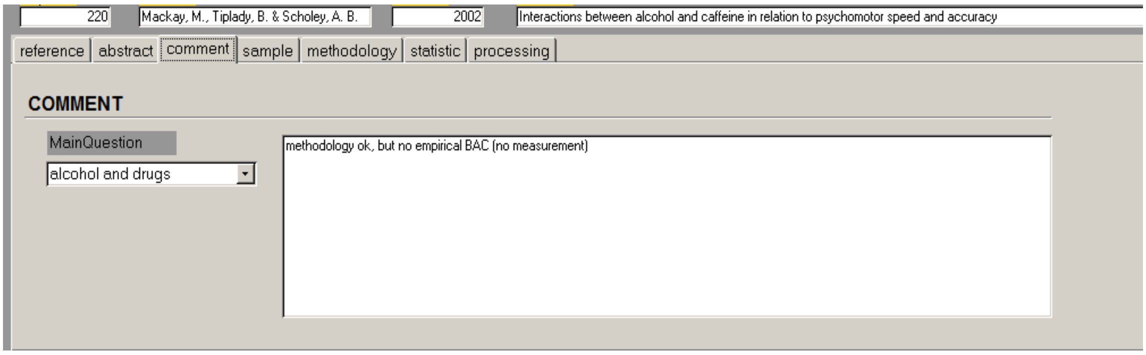
- Bibliographical data of the publication

8.1.1.2 Abstract



- Short summary of the publication

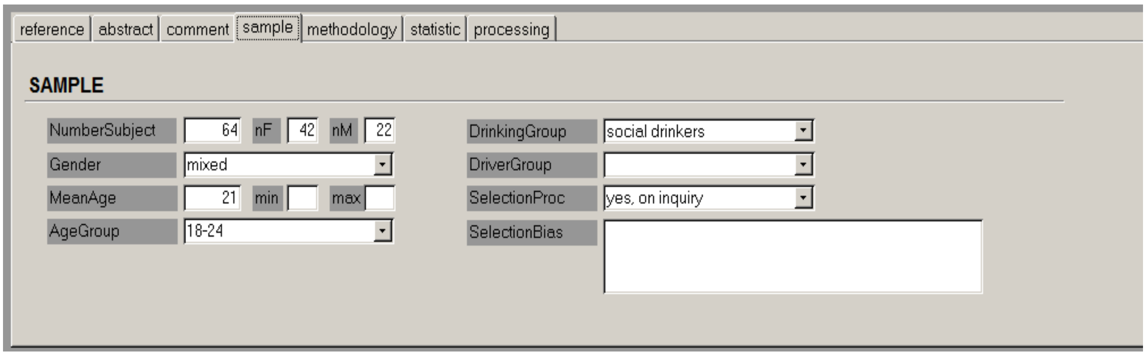
8.1.1.3 Comment



- Free input field: remarks referring to the whole study
- Main Question: main interest of the study

Main Question	Rules
1) single alcohol effect	only the effect of alcohol is of interest
2) different dosage of alcohol	at least two different dosages of alcohol are given to the subjects and differences in effects are of interest
3) different points in time	time of day, absorptive vs. eliminative
4) alcohol and drugs	if combination of alcohol and other substances is of interest (also caffeine, sucrose, acamprosate, nicotine…)
5) different subject groups	e.g. gender, age, aggressive/anxiety dispositions, drinking behaviour, family history of alcoholism, driving/cognitive performance
6) alcohol and sleep deprivation	comparison of alcohol effects with sleep deprivation/prolonged wakefulness or combination of alcohol with sleepiness
7) other	e.g. alcohol tolerance, genetic factors, social/environmental condition, drug expectancy, food intake, reward, feedback

8.1.1.4 Sample



- Number Subject (nF, nM): sample size (number of females, number of males)
- Gender: only female, only male, mixed
- Mean Age (min, max): mean age of the sample (minimum, maximum age)
- Age Group: the chosen category refers to the mean age of the sample

- Drinking Group: alcohol experience of the subjects

Drinking Group	Rules
1) anti-alcoholics	never drink alcohol
2) social drinkers	drink occasionally or regularly in moderation
3) heavy drinkers	drink regularly and heavily (men >7 units/day, women >5 units/day)
4) binge drinkers	drink irregularly and heavily (>5 units on one occasion)
5) alcoholics	alcoholics

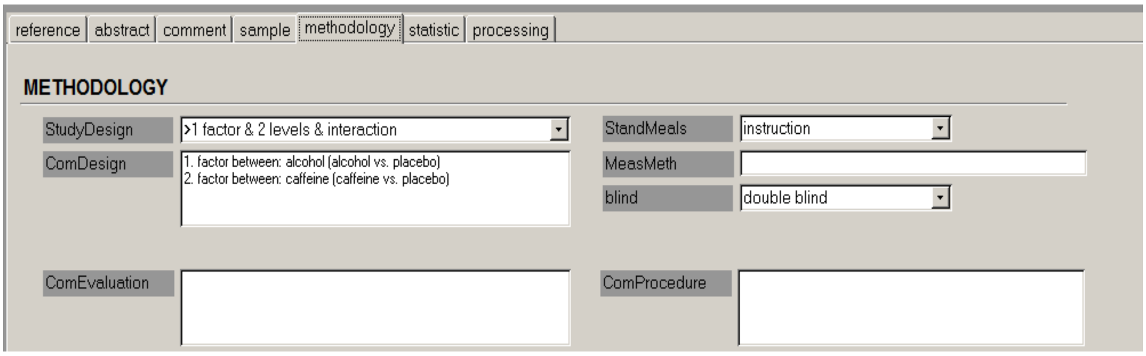
- Driver Group: driving experience of the subjects (for driving studies only)

Driver Group	Rules
1) novice	drivers or pilots with a licence for less than 2 years
2) amateur	for drivers from the general public or if nothing is mentioned
3) professional	professional drivers or pilots

- Selection Proc: checking of in- and exclusion criteria regarding the subjects

Selection Proc	Rules
1) yes, on inquiry	if in- and exclusion criteria are checked only by asking the subjects
2) yes, medical screening	if subjects are medically screened
3) yes, lab parameters	if lab parameters are taken like urine or blood
4) others	if subjects are checked e.g.for normal visual acuity

8.1.1.5 Methodology



- Study Design: number of factors and levels, and if there are interactions and post hoc tests
- Com Design: description of the factors and of the design (within- or between-subject)
- Stand Meals: refers to the standardisation of meals before the alcohol intake

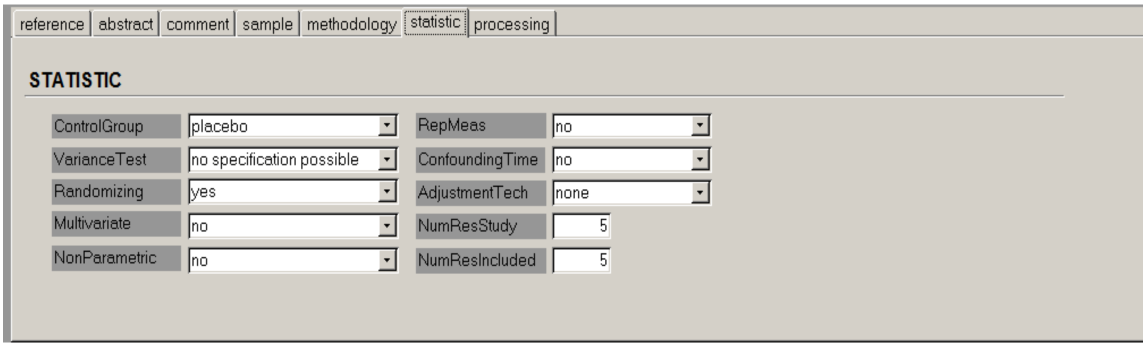
Stand Meals	Rules
1) no standardisation	if it is mentioned that there was no standardisation of meals
2) instruction	subjects were instructed what to eat or not to eat before testing
3) standardisation	observed intake of a standard meal before the alcohol intake

- Meas Meth: Measurement method for testing breath alcohol

- Blinding: refers to the alcohol administration

Blinding	Rules
1) no	the subject and the experimenter know the content of the beverage; if there is no placebo-condition but a non-alcohol-condition
2) single blind	the subject does not know the content of the beverage; if nothing is mentioned, but there is a placebo-condition
3) double blind	neither the subject nor the experimenter know the content of the beverage

8.1.1.6 Statistic



- Control Group: group which receives no alcohol

Control Group	Rules
1) no	no control group for all time points (e.g. only baseline)
2) placebo	placebo control group for all time points
3) non-alcohol	non-alcohol control group for all time points

- Variance Test: testing for variance homogeneity

Variance Test	Rules
1) no	if test is made, but variances are heterogeneous
2) yes	test is made and variances are homogeneous

- Randomising: refers to the assignment of the subjects to the alcohol conditions

Randomising	Rules
1) no	subjects are not randomly assigned to the alcohol condition
2) yes	subjects are randomly assigned to the alcohol condition
3) without relevance	if there is a within-subject design and no assignment is necessary

- Multivariate: refers to the analysis of variance for testing the effect of alcohol

Multivariate	Rules
1) no	if no multivariate analysis of variance is conducted
2) yes	if a multivariate analysis of variance is conducted

- Non-Parametric: refers to the statistical test

Non-Parametric	Rules
1) no	if a parametric test is used
2) yes	if a non-parametric test is used for at least one variable

- Rep Meas: refers to the methodological design (repeated measures)

Rep Meas	Rules
1) no	between-subject design and only one testing time point
2) yes	within-subject design or between-subject design with several testing time points

- Confounding Time: if alcohol effects are confounded with time testing points

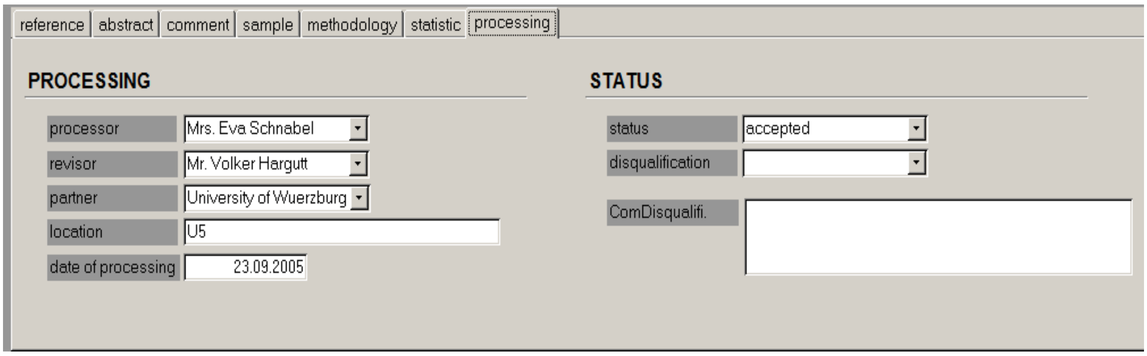
Confounding Time	Rules
1) no	placebo or non-alcohol control group for all time points
2) yes	more than 2 testing time points and no post hoc test more than 2 testing time points and mean value is tested

- Adj Tech: refers to the adjustment of the alpha-level

Adj Tech	Rules
1) none	if authors say they did not make an adjustment
2) Bonferroni	Bonferroni adjustment technique
3) Bonferroni Holm	Bonferroni Holm adjustment technique
4) others	e.g. Dunn's technique

- Num Res Study: number of findings concerning alcohol reported in the study
- Num Res Included: number of findings of the study included into the database

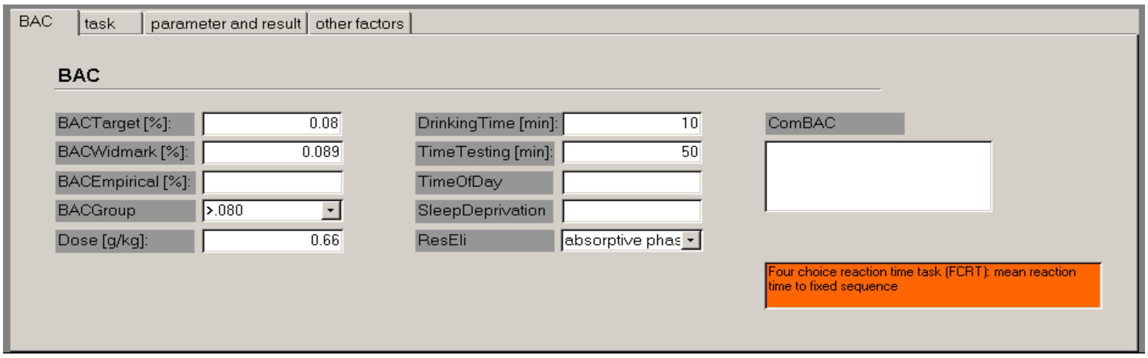
8.1.1.7 Processing



- Processing: information about the processor and date of processing
- Status: if study is accepted or excluded and reasons for disqualification

8.1.2 Findings Level

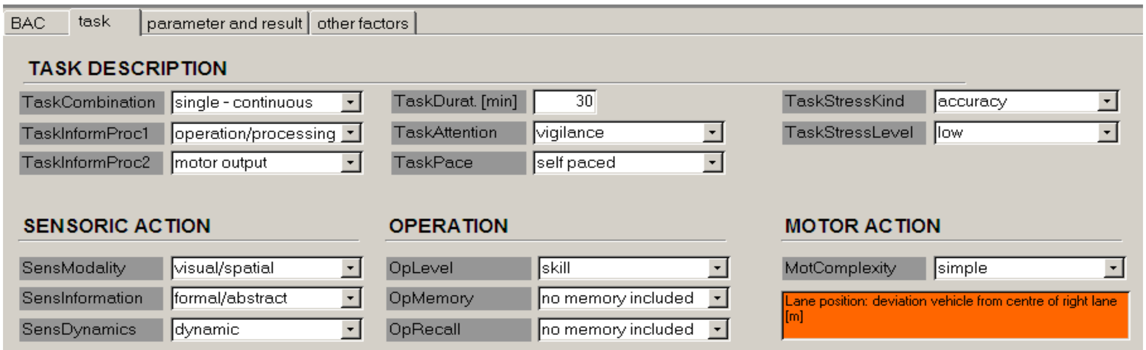
8.1.2.1 BAC



- BAC Group: crude classification referring to the BAC Empirical if reported or to the BAC Target if reported or to the BAC Widmark
- Drinking Time: time subjects are allowed to drink the administered alcohol (if a range is given, mean drinking time is taken)
- Time Testing: time between end of drinking and starting of the test
- Time Of Day: time when testing session takes place
- Sleep Deprivation: “yes”, if sleep duration of all subjects is restricted or if they are awake longer than about 16 hours
- Res Eli: limb of the blood alcohol curve

Res Eli	Rules
1) absorptive phase	<60 min since end of drinking, or if main part of test takes place in this phase, or if BAC after the test is higher than before (even if test is performed within defined eliminative phase)
2) eliminative phase	≥60 min since end of drinking, or if main part of test takes place in this phase, or if test takes place symmetrically in both phases, or if BAC after the test is lower than before (even if test is performed within defined absorptive phase)

8.1.2.2 Task



- Task Combination:

Task combination	**Rules**
1) single – discrete	one task; distinct stimuli
2) single – continuous	one task; no single stimuli
3) double – 2 x discrete	dual task, both tasks are discrete
4) double – discrete & continuous	dual task, one task is discrete, the other continuous
5) double – 2 x continuous	dual task, both tasks are continuous

- Task Inform Proc:

Stages of inform. processing	**Rules**
1) active search	high spatial uncertainty of the stimuli, the operator has to scan the environment for relevant stimuli, without active search of the stimuli at different locations task cannot be performed well
2) sensory perception	perception/detection of the stimulus (usually only one)
3) feature extraction	figure-background-distinction, the relevant information must be selected e.g. concerning shape, colour, auditory frequence
4) operation/processing	cognitive processes are essential, one or more parameters of the task must be inter-or extrapolated or integrated; estimation, calculation...
5) decision	operator decides between different alternatives each representing another strategy (no correct or incorrect answer)
6) reaction planning	activation of one (reaction "yes" or "no") or more (which reaction) motor patterns/schemes, i.e. well-learned sequences of actions
7) motor output	fine adjustment of the necessary motor execution (acceleration, aiming, force of the movement, velocity, steering…)

- Task Attention:

Type of attention	**Rules**
1) alertness	very high short term attention to one or few stimuli
2) sustained	long term attention to a task with HIGH stimuli frequency or with high workload
3) vigilance	long term attention to a task with LOW stimuli frequency

- Task Pace:

Task pace	Rules
1) self paced	if the subject determines the rhythm/the speed of proceeding; memory task: performance phase is crucial, not the learning phase
2) task paced	if the stimuli appear in a fixed rhythm and the subject has to adapt, time for performance cannot be influenced; memory task: performance phase is crucial, not the learning phase

- Task Stress Kind:

Kind of stress	Rules
1) speed	refers to the instruction (as fast as possible)
2) accuracy	refers to the instruction (as accurate as possible)
3) speed & accuracy	refers to the instruction (as fast & accurate as possible); if no instruction is reported: assumption of speed & accuracy if errors AND reaction time are analysed

- Task Stress Level:

Stress level	Rules
1) low	low intensity of stress for the operator; bases on impression
2) medium	more information to process; bases on impression
3) high	different information to process, very high time pressure; bases on impression

- Sens Modality:

Sensory modality	Rules
1) visual/spatial	visual stimuli
2) auditory	auditory stimuli
3) haptic	haptic stimuli
4) vestibular	no stimuli, but effects on the vestibular system are of interest

- Sens Information:

Type of information	Rules
1) formal/abstract	only physical appearance of the stimuli (form or colour) is of importance
2) semantic	interpretation or meaning of the symbol is of importance

- Sens Dynamics:

Sensory dynamics	Rules
1) static	if the stimuli are discrete and appear successively or if the situation can be perceived at once
2) dynamic	if the stimulus or other important objects are moving, i.e. the relevant information is changing continuously

- Op Level:

Operation level	Rules
1) skill	automatic processing, another task can be operated at the same time without serious problems, performance will not improve with training
2) rule	controlled processing, another task can be operated at the same time only with serious problems, performance improves with training
3) knowledge	very high conscious control, effortful, slow, no rules available

- Op Memory:

Memory	Rules
1) no memory included	hardly any memory is required, memory is not the dependent variable
2) STM	recall within 60 sec
3) LTM	recall >60 sec

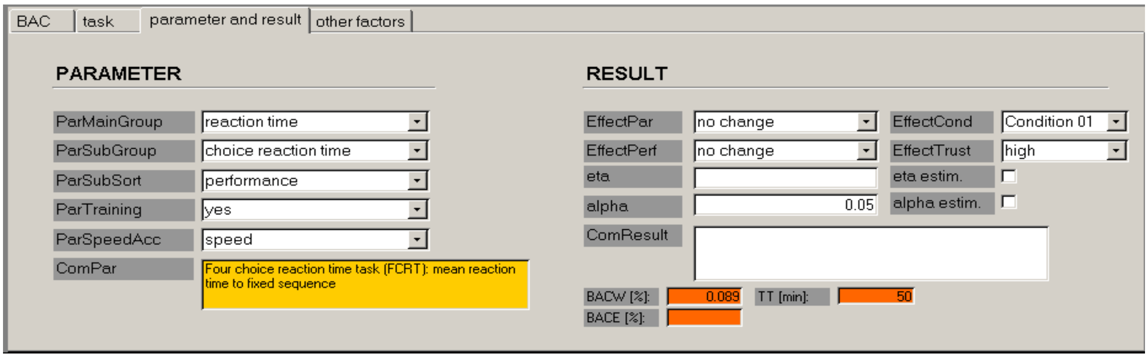
- Op Recall:

Memory recall	Rules
1) no memory included	hardly any memory is required, memory is not the dependent variable
2) recognition	comparison between memorised and presented stimuli
3) cued recall	reproduction of the former learned stimuli is facilitated by cues
4) free recall	reproduction of the former learned stimuli without any help

- Mot Complexity:

Motor complexity	Rules
1) simple	only one button, no fine motor regulations
2) medium	several simple options or fine motor regulation are required
3) complex	coordinative aspects
4) no specification possible	if there is no motor reaction, but verbal response

8.1.2.3 Parameter and result



- Par Main Group: parameter-oriented classification into main groups
- Par Sub Group: parameter-oriented classification into sub groups
- Par Sub Sort: umbrella term for the parameters in the main groups (subjective feeling, behaviour, performance, driving, physiological)

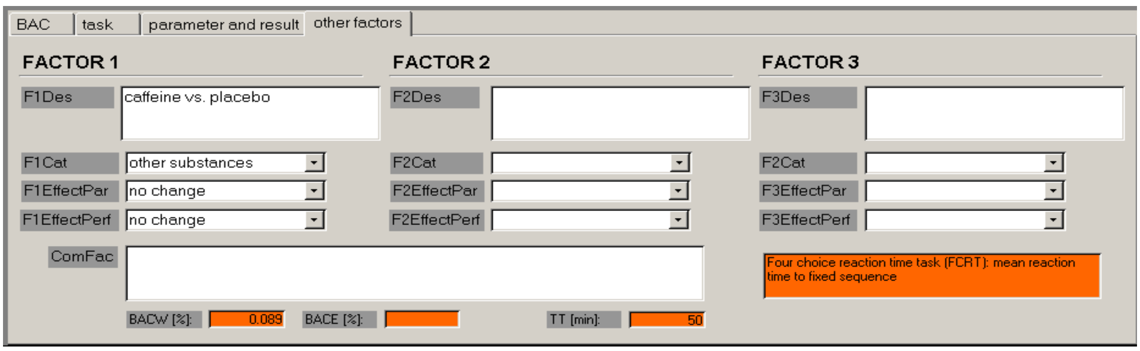
- Par Training: refers to the training of the task before testing (only selected for a performance or driving task)
- Par Speed Acc: refers to the parameter, not to the instruction

Par Speed Acc	Rules
1) speed	if reaction time is measured or total performance time needed for a task
2) accuracy	if number of errors is measured
3) speed & accuracy	if number of errors or a total score in a given time are measured

- Com Par: name and short description of the task
- Effect Par: direction of effect referring to the parameter
- Effect Perf: direction of effect referring to the performance
- Eta: if there is an effect, η^2 is calculated (if enough information is given)
- Alpha: the chosen significance level in the studies, commonly $\alpha = 0.05\%$
- Effect Cond: classification according to the decision tree in Chapter 3.4
- Effect Trust: trustworthiness of the effect depending on interactions
- Eta estim.: check mark if $\eta 2$ is estimated by m and s (via t-value) for a within-subject design
- Alpha estim.: check mark if effect is estimated by t-value and df with a two-tailed test (when there is no post hoc test or no information concerning significance)

The red fields are not for entering data, but are just repetitions of important study information for a better overview for the processor.

8.1.2.4 Other factors



- F1 Des: description of the other factor(s) besides alcohol
- F1 Cat: labelling of the other factor(s) regarding its content
- F1 Effect Par: direction of the interaction effect referring to the parameter
- F1 Effect Perf: direction of the interaction effect referring to the performance

8.2 Raw data referring to the results for the main and subcategories

Table 17: Frequencies of significant impairing effects and no effects[20] per BAC group[21] and category.

A. PERFORMANCE CATEGORIES												
BAC (%)	**<0.01**	**<0.02**	**<0.03**	**<0.04**	**<0.05**	**<0.06**	**<0.07**	**<0.08**	**<0.09**	**<0.10**	**<0.11**	**Total**
1) Reaction time												
no effect	15	14	29	17	23	37	29	32	32	15	5	248
decrease	1	1	2	3	10	14	17	20	19	13	16	116
total	16	15	31	20	33	51	46	52	51	28	21	364
1.1) Simple reaction time												
no effect	7	6	18	10	16	18	16	12	11	7	4	126
decrease	1	0	2	0	5	6	10	8	6	6	8	52
total	8	6	21	10	21	24	26	20	17	13	12	178
1.2) Choice reaction time												
no effect	8	8	10	7	7	19	13	20	21	8	1	122
decrease	0	1	0	3	5	8	7	12	13	7	8	64
total	8	9	10	10	12	27	20	32	34	15	9	186
2) Attention												
no effect	19	18	33	61	42	66	69	57	37	15	12	429
decrease	0	1	2	5	15	19	55	39	59	23	19	237
total	19	19	35	66	57	85	124	96	96	38	31	666
2.1) Categorisation tasks												
no effect	6	9	14	18	10	13	9	12	11	4	1	107
decrease	0	0	1	1	3	3	11	17	32	8	14	90
total	6	9	15	19	13	16	20	29	43	12	15	197
2.2) Vigilance												
no effect	3	0	0	15	6	8	15	8	3	1	0	59
decrease	0	0	0	1	1	2	3	2	4	4	2	19
total	3	0	0	16	7	10	18	10	7	5	2	78
2.3) Cancellation test												
no effect	1	2	1	5	6	6	3	3	0	1	2	30
decrease	0	1	1	1	1	2	2	2	2	1	1	14
total	1	3	2	6	7	8	5	5	2	2	3	44
2.4) Mental arithmetics												
no effect	0	1	4	2	4	5	7	6	2	0	1	32
decrease	0	0	0	0	0	0	2	1	4	2	1	10
total	0	1	4	2	4	5	9	7	6	2	2	42
2.5) Other attention test												
no effect	9	6	14	21	16	34	35	28	21	9	8	201
decrease	0	0	0	2	10	12	37	17	17	8	1	104
total	9	6	14	23	26	46	72	45	38	17	9	305
3) Divided attention												
no effect	13	8	15	48	45	33	38	15	7	14	12	248
decrease	0	4	0	15	4	16	15	19	8	12	7	100
total	13	12	15	63	49	49	53	34	15	26	19	348
3.1) Reactions to 2 stimuli												
no effect	0	5	0	30	31	12	28	7	6	12	7	138
decrease	0	1	0	2	1	3	8	4	2	10	2	33
total	0	6	0	32	32	15	36	11	8	22	9	171

[20] The lines “no effect” also include beneficial effects.
[21] The BAC groups are only presented up to 0.11% in order to clearly represent the raw data and since 96% (n = 5107) of all findings refer to a BAC below 0.12%.

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
3.2) Reactions to 2 tasks												
no effect	13	3	15	18	14	21	10	8	1	2	5	110
decrease	0	3	0	13	3	13	7	15	6	2	5	67
total	13	6	15	31	17	34	17	23	7	4	10	177
4) Psychomotor skills												
no effect	5	15	20	24	24	21	21	19	13	1	0	163
decrease	0	0	3	5	11	16	26	30	24	23	16	154
total	5	15	23	29	35	37	47	49	37	24	16	317
4.1) Hand-eye-coordination												
no effect	4	12	13	13	10	11	7	11	6	1	0	88
decrease	0	0	3	2	5	5	14	11	13	9	7	69
total	4	12	16	15	15	16	21	22	19	10	7	157
4.2) Posture												
no effect	1	3	6	6	9	7	7	4	2	0	0	45
decrease	0	0	0	2	5	11	11	16	10	13	9	77
total	1	3	6	8	14	18	18	20	12	13	9	122
4.3) Other motor functions												
no effect	0	0	1	5	5	3	7	4	5	0	0	30
decrease	0	0	0	1	1	0	1	3	1	1	0	8
total	0	0	1	6	6	3	8	7	6	1	0	38
5) Visual functions												
no effect	11	18	21	22	28	52	56	20	12	10	25	275
decrease	0	2	1	3	11	26	33	31	15	13	44	179
total	11	20	22	25	39	78	89	51	27	23	69	454
5.1) Physiology of the eye												
no effect	3	9	8	13	14	23	35	6	4	6	13	134
decrease	0	1	0	1	2	3	6	5	3	3	16	40
total	3	10	8	14	16	26	41	11	7	9	29	174
5.2) Eye movements												
no effect	4	7	3	5	5	18	6	2	1	0	9	60
decrease	0	1	1	2	6	16	19	19	6	7	19	96
total	4	8	4	7	11	34	25	21	7	7	28	156
5.3) Binocular vision												
no effect	2	2	5	3	1	4	4	2	1	1	3	28
decrease	0	0	0	0	2	6	5	5	4	2	7	31
total	2	2	5	3	3	10	9	7	5	3	10	59
5.4) Complex perceptual functions												
no effect	2	0	5	1	8	7	11	10	6	3	0	53
decrease	0	0	0	0	1	1	3	2	2	1	2	12
total	2	0	5	1	9	8	14	12	8	4	2	65
6) Tracking												
no effect	4	5	5	19	19	19	20	11	11	2	3	118
decrease	0	1	4	8	9	23	17	16	20	6	5	109
total	4	6	9	27	28	42	37	27	31	8	8	227
6.1) Easy compensatory tracking												
no effect	2	1	3	0	2	2	1	3	0	0	2	16
decrease	0	0	1	0	2	2	2	4	3	0	1	15
total	2	1	4	0	4	4	3	7	3	0	3	31
6.2) Difficult compensatory tracking												
no effect	0	0	2	2	1	1	2	0	0	0	0	8
decrease	0	0	0	4	1	3	3	1	0	1	3	16
total	0	0	2	6	2	4	5	1	0	1	3	24
6.3) Easy pursuit tracking												
no effect	2	4	0	17	16	14	17	7	9	2	1	89
decrease	0	1	2	4	6	13	11	7	14	5	1	64
total	2	5	2	21	22	27	28	14	23	7	2	153

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
6.4) Difficult pursuit tracking												
no effect	0	0	0	0	0	2	0	1	2	0	0	5
decrease	0	0	1	0	0	5	1	4	3	0	0	14
total	0	0	1	0	0	7	1	5	5	0	0	19
7) En-/Decoding												
no effect	7	18	26	47	16	41	27	33	45	12	8	280
decrease	0	2	8	11	6	15	33	30	29	17	10	161
total	7	20	34	58	22	56	60	63	74	29	18	441
7.1) Information processing												
no effect	2	7	14	29	6	10	9	16	8	4	1	106
decrease	0	0	1	7	2	6	13	13	8	5	4	59
total	2	7	15	36	8	16	22	29	16	9	5	165
7.2) Memory												
no effect	5	11	12	18	10	31	18	17	37	8	7	174
decrease	0	2	7	4	4	9	20	17	21	12	6	102
total	5	13	19	22	14	40	38	34	58	20	13	276
8) Driving												
no effect	11	11	10	31	39	12	14	18	24	7	5	182
decrease	1	4	5	18	30	17	16	12	16	10	6	135
total	12	15	15	49	69	29	30	30	40	17	11	317
8.1) Driving simulator												
no effect	9	5	10	8	24	12	12	12	23	7	4	126
decrease	1	3	3	7	13	10	10	11	12	7	4	81
total	10	8	13	15	37	22	22	23	35	14	8	207
8.2) Closed course												
no effect	0	1	0	4	12	0	1	0	0	0	0	18
decrease	0	0	0	8	16	2	1	0	0	0	0	27
total	0	1	0	12	28	2	2	0	0	0	0	45
8.3) Flight simulator												
no effect	2	5	0	19	3	0	1	6	1	0	1	38
decrease	0	1	2	3	1	5	5	1	4	3	2	27
total	2	6	2	22	4	5	6	7	5	3	3	65
SUM	**87**	**122**	**184**	**337**	**332**	**427**	**486**	**402**	**371**	**193**	**193**	**3134**

B. MOOD CATEGORIES

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
9) Mood												
no effect	76	110	198	132	83	122	119	129	137	66	78	1250
decrease	4	10	28	47	58	75	74	103	84	55	71	609
total	80	120	226	179	141	197	193	232	221	121	149	1859
9.1) Experienced intoxication												
no effect	8	15	15	4	8	6	4	2	5	1	3	71
decrease	2	7	19	17	33	50	22	56	46	31	33	316
total	10	22	34	21	41	56	26	58	51	32	36	387
9.2) Unpleasant physical sensations												
no effect	8	23	36	13	12	14	4	15	21	17	11	174
decrease	0	0	1	5	8	6	7	10	5	4	12	58
total	8	23	37	18	20	20	11	25	26	21	23	232
9.3) General well-being												
no effect	0	0	1	1	1	2	0	1	0	0	2	8
decrease	0	1	0	0	0	0	2	0	1	0	0	4
total	0	1	1	1	1	2	2	1	1	0	2	12

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
9.4) Subjective rating of performance												
no effect	2	2	9	10	6	3	8	2	3	2	0	47
decrease	1	0	0	4	2	3	7	4	5	6	5	37
total	3	2	9	14	8	6	15	6	8	8	5	84
9.5) Physiological measurements												
no effect	1	0	6	3	0	8	7	7	8	1	0	41
decrease	0	0	0	0	0	0	0	0	2	0	0	2
total	1	0	6	3	0	8	7	7	10	1	0	43
9.6) Arousal/activity												
no effect	18	20	45	30	15	29	25	38	25	12	24	281
decrease	0	0	5	8	6	7	15	11	8	6	4	70
total	18	20	50	38	21	36	40	49	33	18	28	351
9.7) Pleasure												
no effect	24	29	54	39	25	35	43	39	50	20	31	389
decrease	0	0	0	2	4	0	7	2	2	3	4	24
total	24	29	54	41	29	35	50	41	52	23	35	413
9.8) Dominance												
no effect	4	3	6	5	1	4	4	3	4	2	0	36
decrease	0	0	0	0	0	0	1	0	0	0	0	1
total	4	3	6	5	1	4	5	3	4	2	0	37
9.9) Tiredness												
no effect	7	9	15	13	10	14	15	14	11	6	4	118
decrease	1	2	3	10	5	7	9	13	11	5	9	75
total	8	11	18	23	15	21	24	27	22	11	13	193
9.10) Aggressive feelings												
no effect	4	3	5	8	2	5	6	4	3	1	0	41
decrease	0	0	0	0	0	2	2	4	2	0	1	11
total	4	3	5	8	2	7	8	8	5	1	1	52
C. SOCIAL BEHAVIOUR CATEGORIES												
10) Aggressive behaviour												
no effect	0	0	1	2	0	1	0	2	9	0	6	21
decrease	0	0	0	0	0	1	1	3	3	8	11	27
total	0	0	1	2	0	2	1	5	12	8	17	48
SUM	**80**	**120**	**227**	**181**	**141**	**199**	**194**	**237**	**233**	**129**	**166**	**1907**

8.3 Raw data referring to the results for the dimensions & subdimensions

Table 18: Frequencies of significant impairing effects and no effects[22] per BAC group[23] and subdimension.

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
1) Stages of information processing 1												
1.1) Active search												
no effect	0	1	0	3	0	4	0	0	0	0	1	9
decrease	0	0	0	0	0	6	0	2	0	2	9	19
total	0	1	0	3	0	10	0	2	0	2	10	28
1.2) Sensory perception												
no effect	10	8	11	26	15	23	28	10	15	4	1	151
decrease	0	1	2	11	15	11	8	14	21	10	6	99
total	10	9	13	37	30	34	36	24	36	14	7	250
1.3) Feature extraction												
no effect	25	39	59	110	79	89	97	92	57	37	18	702
decrease	0	4	3	16	15	35	82	65	70	38	34	362
total	25	43	62	126	94	124	179	157	127	75	52	1064
1.4) Operation/processing												
no effect	23	21	31	52	50	62	44	53	63	17	16	432
decrease	1	6	11	22	27	27	42	36	40	24	15	251
total	24	27	42	74	77	89	86	89	103	41	31	683
1.5) Decision												
no effect	0	2	2	3	6	3	2	2	5	4	0	29
decrease	0	0	0	0	0	2	4	0	1	2	2	11
total	0	2	2	3	6	5	6	2	6	6	2	40
1.6) Reaction planning												
no effect	7	6	20	10	18	19	18	14	13	7	6	138
decrease	1	0	2	0	8	9	19	13	9	7	9	77
total	8	6	22	10	26	28	37	27	22	14	15	215
1.7) Motor output												
no effect	13	17	22	48	47	50	41	27	23	4	8	300
decrease	0	3	7	17	23	42	48	50	40	27	22	279
total	13	20	29	65	70	92	89	77	63	31	30	579
2) Stages of information processing 2												
2.1) Active search												
no effect	0	0	0	0	0	0	0	0	0	0	0	0
decrease	0	0	0	0	0	0	0	2	0	0	0	2
total	0	0	0	0	0	0	0	2	0	0	0	2
2.2) Sensory perception												
no effect	7	6	19	10	16	18	16	12	11	7	4	126
decrease	1	0	2	0	5	6	10	8	6	6	8	52
total	8	6	21	10	21	24	26	20	17	13	12	178
2.3) Feature extraction												
no effect	0	0	0	3	0	0	1	1	0	0	3	8
decrease	0	0	1	0	0	0	2	4	3	3	0	13
total	0	0	1	3	0	0	3	5	3	3	3	21
2.4) Operation/processing												
no effect	8	12	12	31	28	28	28	9	5	7	4	172
decrease	0	2	3	12	13	24	25	17	15	8	11	130
total	8	14	15	43	41	52	53	26	20	15	15	302

[22] The lines “no effect” also include beneficial effects.
[23] The BAC groups are only presented up to 0.11% in order to clearly represent the raw data and since 96% (n = 2877) of the 2983 performance findings refer to a BAC below 0.12%.

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
2.5) Decision												
no effect	2	0	0	2	4	0	0	0	0	1	0	9
decrease	0	0	0	1	0	1	1	2	0	1	0	6
total	2	0	0	3	4	1	1	2	0	2	0	15
2.6) Reaction planning												
no effect	36	37	66	122	84	103	109	91	69	37	25	779
decrease	0	5	6	24	22	38	76	71	85	40	36	403
total	36	42	72	146	106	141	185	162	154	77	61	1182
2.7) Motor output												
no effect	11	14	9	23	31	16	7	23	17	6	4	161
decrease	1	4	4	18	23	17	20	18	17	11	7	140
total	12	18	13	41	54	33	27	41	34	17	11	301
3) Task combination												
3.1) Single – discrete												
no effect	44	61	100	139	90	164	137	128	125	42	29	1059
decrease	1	4	15	18	34	62	119	112	111	63	65	604
total	45	65	115	157	124	226	256	240	236	105	94	1663
3.2) Single – continuous												
no effect	17	23	29	60	79	48	53	49	43	10	9	420
decrease	1	6	10	27	46	50	65	50	62	29	23	369
total	18	29	39	87	125	98	118	99	105	39	32	789
3.3) Double – 2x discrete												
no effect	0	5	6	29	22	21	35	17	7	7	10	159
decrease	0	1	0	2	1	3	9	6	4	5	1	32
total	0	6	6	31	23	24	44	23	11	12	11	191
3.4) Double – discrete & continuous												
no effect	16	3	10	23	23	18	7	4	1	10	2	117
decrease	0	3	0	19	7	15	5	13	4	9	6	81
total	16	6	10	42	30	33	12	17	5	19	8	198
3.5) Double – 2x continuous												
no effect	1	2	0	1	2	0	0	0	0	0	0	6
decrease	0	0	0	0	0	2	1	0	0	3	0	6
total	1	2	0	1	2	2	1	0	0	3	0	12
4) Type of attention												
4.1) Alertness												
no effect	25	27	44	62	55	76	59	58	44	24	22	496
decrease	1	2	5	7	13	30	60	58	58	28	45	307
total	26	29	49	69	68	106	119	116	102	52	67	803
4.2) Sustained												
no effect	35	42	59	111	101	80	84	65	47	30	14	668
decrease	1	6	6	28	40	50	72	54	50	33	23	363
total	36	48	65	139	141	130	156	119	97	63	37	1031
4.3) Vigilance												
no effect	3	2	2	20	11	13	19	15	3	1	2	91
decrease	0	3	5	12	11	12	10	16	7	4	5	85
total	3	5	7	32	22	25	29	31	10	5	7	176
5) Task pace												
5.1) Self paced												
no effect	24	43	52	99	60	104	83	67	81	25	21	659
decrease	1	6	16	19	29	53	81	76	96	43	46	466
total	25	49	68	118	89	157	164	143	177	68	67	1125
5.2) Task paced												
no effect	49	48	81	143	132	126	126	102	81	43	28	959
decrease	1	8	8	45	53	66	109	88	73	48	39	538
total	50	56	89	188	185	192	235	190	154	91	67	1497

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
6) Stress level												
6.1) Low												
no effect	18	30	45	60	67	64	81	55	69	21	10	520
decrease	1	5	10	11	30	47	60	57	51	45	40	357
total	19	35	55	71	97	111	141	112	120	66	50	877
6.2) Medium												
no effect	38	44	60	87	85	138	103	101	93	32	25	806
decrease	0	5	14	24	41	57	100	85	106	41	42	515
total	38	49	74	111	126	195	203	186	199	73	67	1321
6.3) High												
no effect	22	20	40	105	64	49	48	42	14	20	15	439
decrease	1	4	1	31	17	28	44	39	24	24	15	228
total	23	24	41	136	81	77	92	81	38	44	30	667
7) Stress kind												
7.1) Speed												
no effect	12	5	27	18	18	23	23	15	19	8	4	172
decrease	1	1	3	8	13	13	12	17	6	9	9	92
total	13	6	30	26	31	36	35	32	25	17	13	264
7.2) Accuracy												
no effect	26	35	32	80	76	58	57	54	60	24	10	512
decrease	1	8	13	29	38	65	66	63	61	46	32	422
total	27	43	45	109	114	123	123	117	121	70	42	934
7.3) Speed & accuracy												
no effect	40	54	86	154	122	170	152	129	97	41	36	1081
decrease	0	5	9	29	37	54	126	101	114	55	56	586
total	40	59	95	183	159	224	278	230	211	96	92	1667
8) Sensory modality												
8.1) Visual/spatial												
no effect	70	87	123	208	169	209	178	160	147	54	42	1447
decrease	2	13	23	60	75	112	169	149	154	88	79	924
total	72	100	146	268	244	321	347	309	301	142	121	2371
8.2) Auditory												
no effect	5	3	12	14	10	18	19	12	14	9	2	118
decrease	0	0	1	1	3	5	7	13	12	4	4	50
total	5	3	13	15	13	23	26	25	26	13	6	168
8.3) Haptic												
no effect	0	0	0	1	4	3	4	2	0	0	0	14
decrease	0	0	0	0	0	0	0	0	0	0	0	0
total	0	0	0	1	4	3	4	2	0	0	0	14
8.4) Vestibular												
no effect	1	3	6	7	9	7	7	4	2	0	0	46
decrease	0	0	0	3	5	11	11	14	10	13	9	76
total	1	3	6	10	14	18	18	18	12	13	9	122
9) Type of information												
9.1) Formal/abstract												
no effect	64	75	110	208	176	193	176	150	118	59	41	1370
decrease	2	12	18	55	71	103	148	137	141	73	66	826
total	66	87	128	263	247	296	324	287	259	132	107	2196
9.2) Semantic												
no effect	9	14	21	25	16	38	27	23	41	11	9	234
decrease	0	2	6	6	9	17	35	18	23	19	18	153
total	9	16	27	31	25	55	62	41	64	30	27	387

BAC (%)	<0.01	<0.02	<0.03	<0.04	<0.05	<0.06	<0.07	<0.08	<0.09	<0.10	<0.11	Total
10) Sensory dynamics												
10.1) Static												
no effect	52	67	111	169	123	183	168	146	134	57	37	1247
decrease	1	7	14	31	37	75	140	114	132	73	64	688
total	53	74	125	200	160	258	308	260	266	130	101	1935
10.2) Dynamic												
no effect	21	22	22	65	74	51	43	30	27	11	13	379
decrease	1	7	10	31	43	45	39	40	31	18	19	284
total	22	29	32	96	117	96	82	70	58	29	32	663
11) Operation level												
11.1) Skill-based												
no effect	45	43	62	116	107	102	87	68	61	20	17	728
decrease	2	7	15	43	60	85	87	93	73	54	55	574
total	47	50	77	159	167	187	174	161	134	74	72	1302
11.2) Rule-based												
no effect	31	50	81	129	105	143	143	128	113	48	31	1002
decrease	0	7	10	22	26	43	112	86	107	51	40	504
total	31	57	91	151	131	186	255	214	220	99	71	1506
11.3) Knowledge-based												
no effect	2	1	2	7	4	6	2	2	2	5	2	35
decrease	0	0	0	1	2	4	5	2	1	5	2	22
total	2	1	2	8	6	10	7	4	3	10	4	57
12) Memory												
12.1) Short term memory												
no effect	5	2	14	20	10	29	11	21	25	5	8	150
decrease	0	1	4	5	3	8	16	10	17	9	6	79
total	5	3	18	25	13	37	27	31	42	14	14	229
12.2) Long term memory												
no effect	0	9	4	8	1	5	10	3	15	3	1	59
decrease	0	1	4	3	3	5	8	11	7	4	3	49
total	0	10	8	11	4	10	18	14	22	7	4	108
13) Memory recall												
13.1) Recognition												
no effect	3	8	15	17	6	25	11	21	15	2	6	129
decrease	0	0	5	4	0	2	9	8	11	2	5	46
total	3	8	20	21	6	27	20	29	26	4	11	175
13.2) Cued recall												
no effect	0	0	1	5	3	0	5	1	11	1	0	27
decrease	0	0	0	1	0	0	4	3	3	4	0	15
total	0	0	1	6	3	0	9	4	14	5	0	42
13.3) Free recall												
no effect	2	3	2	6	2	9	5	2	14	5	3	53
decrease	0	2	3	3	6	11	11	10	10	7	4	67
total	2	5	5	9	8	20	16	12	24	12	7	120
14) Motor complexity												
14.1) Simple												
no effect	29	38	80	94	84	128	110	99	89	37	24	812
decrease	2	6	10	15	25	40	79	60	58	38	37	370
total	31	44	90	109	109	168	189	159	147	75	61	1182
14.2) Medium												
no effect	30	35	37	79	73	75	62	65	49	14	18	537
decrease	0	3	8	23	43	51	59	70	74	30	34	395
total	30	38	45	102	116	126	121	135	123	44	52	932
14.3) High												
no effect	16	15	22	64	52	37	43	21	16	12	8	306
decrease	0	5	4	22	11	29	47	36	31	32	20	237
total	16	20	26	86	63	66	90	57	47	44	28	543

8.4 Description of the selected tasks for the interrater reliability

1. Simple visual reaction time test:

"The subject is asked to press space-bar of the key-board as soon as possible after the random appearance of a letter in the middle of the computer screen. The time between the stimulus and the reaction is recorded with an accuracy of 1 msec. The amount of stimuli and the range of the random presentation speed of the stimuli can be fully predetermined. In the present study, a set of 10 stimuli was presented at each test occasion and the mean and standard deviation of the reaction times were recorded." (Nuotto & Korttila, 1991)

2. Four choice reaction time test:

"A BBC Master microcomputer was used to control the experiment and record responses to the nearest centisecond. The stimuli were digits, each measuring approximately 5 x 5 mm, which appeared in green at the centre of a Philips 80 monitor. For the 2-choice task, the stimuli were the digits 1 and 2, and the corresponding response keys were "Q" (left index finger) and "–" (right index finger) of the computer keyboard; for the 4-choice task, the stimuli were the digits 1, 2, 3, and 4 [response keys = "A" (left middle finger), "S" (left index finger), ":" (right index finger), and "J" (right middle finger), respectively]; and for the 8-choice task, the stimuli were the digits 1, 2, 3, 4, 5, 6, 7, and 8 [response keys = "Z", "X", "C", "V", "M", ",", ".", and "/", from left little finger to right little finger]. The response keys were clearly labeled with the appropriate numbers." (Maylor, Rabbitt, James & Kerr, 1992)

3. The digit symbol substitution task:

"A computerized version of the Digit Symbol Substitution Test (DSST; McLeod et al., 1982) was administered on day 4 of each acamprosate period. On each trial, subjects were presented with a random digit from 1 to 9 on the computer screen. Subjects used a numeric keypad to replicate the geometric pattern associated with that digit from 9 digit-symbol codes displayed at the top of the screen. Measures included the number of trials (patterns) attempted and the number of trials (patterns) correct within 90 sec." (Brasser, McCaul & Houtsmuller, 2004)

4. Mackworth clock test:

"The sustained attention test is a variant of the classic Macworth 'Clock Test'. The subject is seated in front of a computer screen displaying a circular arrangement of 60 grey dots, which simulate the second marks on a clock. The luminance of each dot briefly increased in clockwise rotation at a rate of two dots per second. Occasionally, the rotation proceeds with a 'double jump' by skipping one of the dots in the normal sequence. The dependent variable is the number of correct detections. Test duration is 45 minutes, and 10 signals occur within each successive 15-minute period." (Ramaekers, Muntjewerff, Uiterwijk et al., 1996)

5. D2-Test:

"The test d2 (Brickenkamp, 1994) assesses the level of attention and concentration. Fourteen rows each with 49 'd's and 'p's are presented. The characters are marked by either one, two, three or four small lines (Fig 2). The subjects' task is to cross out all 'd's marked by two lines but to ignore all other characters. For each row, there is a time limit of 20 sec. The percentiles – indicating how many subjects (%) of a control group matched for age and education performed similar or worse – for the total number of characters dealt with, the error rate (%), and the 'concentration', i.e. the number of correctly minus wrongly marked characters, were analyzed." (Wegner & Fahler, 1999)

6. Serial seven:

"Participants were presented with a three-digit number in the range 800-999, from which they had to subtract seven, then seven from the result and so on for 2 min. Responses were made on a numeric keypad displayed on the screen. The number of responses and errors was recorded." (Tiplady, Franklin & Scholey, 2004)

7. Go/NoGo task:

"Stop Signal Task (SST). This task requires subjects to make quick key responses to visually presented go signals and to inhibit any response when a visual stop signal is suddenly presented. The current test is adapted from an earlier version of Fillmore et al (Fillmore et al 2002). The go signals are four 1.5 cm letters (ABCD) presented one at a time in the center of a computer screen. Subjects are required to respond to each letter as quickly as possible by pressing one of two response buttons. One button is pressed to indicate that 'A' or 'C' appeared and the other to indicate 'B' or 'D'. Letters are displayed for 500 msec and the computer screen is blank for 1.5 sec interstimulus interval before the next letter is displayed. This provides a period of 2 sec in which the subject can respond to a letter. A single test consists of 176 trials in which each of the 4 letter stimuli is presented equally often. A stop signal occurred in 48 trials during a test. The stop signal consists of visual cue, i.e. '*', that appears in one of the four corners of the screen. Subjects are required to withhold any response in case a stop-signal is presented. Stop signals are presented 12 times at each of the four delays after the onset of a letter: 50, 150, 250, 350 msec. Trials always begin with a 500 msec preparation interval in which a fixation point appears at the center of the screen. The task lasts about 10 minutes. Dependant variable is the proportion of inhibited responses on stop trials (IR)." (Ramaekers, Kuypers, Wood et al., 2004)

8. <u>Divided attention task (visual task & auditory discrimination):</u>

"The divided attention task measures the ability to divide attention between two sensory modalities (dual task performance), here visuo-spatial and auditory stimulation. The visual task was to detect a square pattern, consisting of four out of eight crosses presented on the computer screen. All crosses constantly changed their location within a grid of four by four positions (see Fig. 1). In the auditory task, two tones alternated, and the subject had to detect irregularities in the two-tone sequence. To ensure correct single task performance, subjects had to perform a probe trial for each task. In the following test, 100 visual and 200 auditory stimuli were presented simultaneously. Reaction times, misses, anticipations and false positives were recorded." (Schulte, Müller-Oehring, Strasburger et al., 2001)

9. <u>Divided attention task (tracking & visual task):</u>

"Participants completed a divided attention task at 1030 and 1430 h on each testing day. This 15-min task required participants to track a moving target across a video screen using a joystick while simultaneously responding with a button press (non dominant index finger) to the appearance of stimuli in the center of the target or periphery of the screen. A total of 52 stimuli were presented at random intervals throughout each task period. Dependent measures for this task were reaction time (sec) to central and peripheral stimuli and tracking deviations measured in pixels." (Drake, Roehrs, Turner et al., 2003)

10. Circular lights:

“Psychomotor Performance Task: A commercially available psychomotor assessment device (Saccadic Fixator and Sequence Rotator, Wayne Engineering, Skokie, Ill) was used. The center of the panel was 163 cm from the floor, and the subject stood at an approximately 81-cm horizontal distance from a wall-mounted panel. The panel consisted of 16 button-lights mounted in a circle with a 56-cm diameter. A session-start button, session light, and a point counter were located at the center of the panel. Subjects started a one-minute session by pressing the start button, which resulted in the illumination of the session light and one of the peripheral lights. Pressing of the button associated with the illuminiated peripheral light extinguished it, produced a brief feedback tone, incremented the point counter by one digit, and resulted in the illumination of a new light at a random position. Subjects were instructed to attempt to earn as many points as possible and were paid approximately 0.1 cents per point.“ (Griffiths, Bigelow & Liebson, 1983)

11. Balance test:

“Balance was measured by asking subjects to stand upright on one foot with eyes closed and arms extended to the side at shoulder height. Each trial lasted 30 seconds or until the subject touched the raised foot to the ground. Subjects completed two trials on each foot during each data collection period, thus the maximum score was 60 seconds measured separately for the right and left foot.“ (McCaul, Wand, Eissenberg et al., 2000)

12. Finger tapping:

“The subject tapped as quickly as possible with the index finger of the preferred hand on a morse key for 1 min. The total number of taps was recorded.“ (Fagan, Tiplady & Scott, 1994)

13. Pursuit rotor task:

“A computerizes pursuit rotor (PR) tracking task requiring psychomotor coordination was used to measure subjects’ performance. The task consisted of a computer and monitor on a table top, 75 cm above the floor. The subjects sat in a chair directly in front of a computer screen that displayed a rectangular track (14 cm x 11.5 cm). Subjects were required to track an on-screen target (diameter = 1.3 cm) that moved at 23 RPMs clockwise around the track. To track the target, the subject controlled an on-screen circular cross-hair sight (diameter =

1.3 cm) by moving a computer mouse on the table top. The subject was required to keep the sight over the rotating target as long as possible during a trial. The PR task provided no feedback to the subject about performance. The computer measured the performance as the percentage of time on target (%TOT) during each trial and stored the trial scores on a computer disk.“ (Fillmore & Vogel Sprott, 1994)

14. Tracometer:

“Subjects were seated before a tracking panel displaying five targets, 2.4 mm in diameter and 41 mm apart. The targets appeared as blue-green dots and were illuminated one at a time. Subjects used a steering wheel to control a transparent plastic pointer marked with a cross-hair. The task required the subjects to align the cross-hair over an illuminated target for 200 ms in order to extinguish the target and illuminate the next target. Each trial consisted of 100 targets, presented in one of 10 preset sequences that ensured that each of the 20 possible movements between pairs of targets occurred five times. A control unit, placed in an adjacent room behind a one-way mirror, recorded the target count during a trial and the total time taken to complete a trial. When the task is well learned, a trial is typically completed within 2 minutes and a subject’s trial scores on the task vary within a 2-second range.“ (Easdon & Vogel Sprott, 1996)

15. Compensatory tracking task:

“The TRK test displays two vertical illuminated bars in the central visual field. One bar is stationary at 5 cm height; the other moves up and down in response to a forcing function. Using a joystick subjects attempt to maintain the moving bar and the stationary bar at the same height. Trial duration is six minutes, and the error score is the derivation in cm of the moving bar from the fixed bar.“ (Burns & Moskowitz, 1990)

16. Critical compensatory tracking task:

“CTT measures the subject’s ability to control a displayed error signal in a first-order compensatory tracking task. Error is displayed as a horizontal deviation of a cursor from the midpoint on a horizontal, linear scale. Compensatory joystick movements null the error by returning the cursor to the midpoint. The frequency at which the subject loses the control is the critical frequency of λ_c. The test includes five trials of which the lowest and the highest score are removed; the average of the remaining scores is taken as the final score (Jex et al. 1966).“ (Ramaekers, Kuypers, Wood et al., 2004)

17. Rapid visual information processing task:

“The RVIP assesses the performance of attentional mechanisms in remaining vigilant to periodically occurring events. Subjects are required to monitor a series of single digits (0-9) appearing on the screen at a rate of 100 digits every minute and respond to consecutive sequences of odd or even digits by pressing a button. At each assessment the duration of the task is 10 minutes. The response measures are the mean reaction time in milliseconds and the number of correct responses made.“ (Milani & Curran, 2000)

18. Recall task:

“Auditory Short-Term Memory (STM): Subjects heard lists of 12 words presented at 2 s inter-word intervals. On completion of each list, subjects had 20 s to free-recall as many words as possible.“ (Millar, Hammersley & Finnigan, 1992)

19. Driving task (road tracking):

“The motorway route consisted of an S-shaped four lane road loop with long, straight stretches, few turns and speed limits between 70 and 100 km/h. Subjects drove for 30 min, and were instructed to stay in the right hand lane and to obey all lane markings and speed signs. There were no other cars on the simulated road. The dependent measures included (1) tracking, measured as the deviation in feet of the center of the vehicle from the center of the right hand lane; (2) tracking variability, the S.D. of tracking; (3) speed deviation, calculated as the difference in speed of the vehicle from the speed limit; (4) speed variability, the standard deviation of speed deviation; and (5) off-road incidents, calculated as the number of times that the simulated vehicle left the road.” (Arnedt, Wild, Munt & McLean, 2001)

8.5 References: Studies accepted for the meta-analysis

Abroms, B. D., & Fillmore, M. T. (2004). Alcohol-induced impairment of inhibitory mechanisms involved in visual search. *Experimental and Clinical Psychopharmacology, 12*(4), 243-250.

Abroms, B. D., Fillmore, M. T., & Marczinski, C. A. (2003). Alcohol-induced impairment of behavioral control: effects on the alteration and suppression of prepotent responses. *Journal of Studies on Alcohol, 64*(5), 687-695.

Abroms, B. D., Gottlob, L. R., & Fillmore, M. T. (2006). Alcohol effects on inhibitory control of attention: distinguishing between intentional and automatic mechanisms. *Psychopharmacology, 188*(3), 324-334.

Acheson, S. K., Stein, R. M., & Swartzwelder, H. S. (1998). Impairment of semantic and figural memory by acute ethanol: Age-dependent effects. *Alcoholism: Clinical and Experimental Research, 22*(7), 1437-1442.

Aksnes, E. G. (1954). Effect of small dosages of alcohol upon performance in a Link trainer. *Journal of Aviation Medicine, 25*(6), 680-688.

Andre, J. T. (1996). Visual functioning in challenging conditions: Effects of alcohol consumption, luminance, stimulus motion, and glare on contrast sensitivity. *Applied Journal of Experimental Psychology, 2*(3), 250-269.

Andre, J. T., Tyrrell, R. A., Leibowitz, H. W., Nicholson, M. E., et al. (1994). Measuring and predicting the effects of alcohol consumption on contrast sensitivity for stationary and moving gratings. *Perception and Psychophysics, 56*(3), 261-267.

Arnedt, J. T., Wilde, G. J. S., Munt, P. W., & Maclean, A. W. (2000). Simulated driving performance following prolonged wakefulness and alcohol consumption: separate and combined contributions to impairment. *Journal of Sleep Research, 9*(3), 233-241.

Arnedt, J. T., Wilde, G. J. S., Munt, P. W., & MacLean, A. W. (2001). How do prolonged wakefulness and alcohol compare in the decrements they produce on a simulated driving task? *Accident Analysis & Prevention, 33*(3), 337-344.

Azcona, O., Barbanoj, M. J., Torrent, J., & Jane, F. (1995). Evaluation of the central effects of alcohol and caffeine interaction. *British Journal of Clinical Pharmacology, 40*, 393-400.

Badian, M., Brettel, H. F., Malerczyk, V., Ostrowski, J., & Sittig, W. (1987). Untersuchungen zur Kombination von Alkohol und Piracetam. *Blutalkohol, 24*(5), 333-340.

Bailey, D. S., & Taylor, S. P. (1991). Effects of alcohol and aggressive disposition on human physical aggression. *Journal of Research in Personality, 25*(3), 334-342.

Baloh, R. W., Sharma, S., Moskowitz, H., & Griffith, R. (1979). Effect of alcohol and marijuana on eye movements. *Aviation, Space, and Environmental Medicine, 50*(1), 18-23.

Banks, S., Catcheside, P., Lack, L., Grunstein, R., & McEvoy, D. (2004). Low levels of alcohol impair driving simulator performance and reduce perception of crash risk in partially sleep deprived subjects. *Sleep, 27*(6), 1063-1067.

Barkley, R. A., Murphy, K. R., O'Connell, T., Anderson, D., & Connor, D. F. (2006). Effects of two doses of alcohol on simulator driving performance in adults with attention-deficit/hyperactivity disorder. *Neuropsychology, 20*(1), 77-87.

Barrett, P. R., Horne, J. A., & Reyner, L. A. (2004). Sleepiness combined with low alcohol intake in women drivers: greater impairment but better perception than men? *Sleep, 27*(6), 1057-1062.

Barrett, P. R., Horne, J. A., & Reyner, L. A. (2005). Early evening low alcohol intake also worsens sleepiness-related driving impairment. *Human Psychopharmacology: Clinical and Experimental, 20*(4), 287-290.

Bartholow, B. D., Pearson, M., Sher, K. J., Wieman, L. C., Fabiani, M., & Gratton, G. (2003). Effects of alcohol consumption and alcohol susceptibility on cognition: A psychophysiological examination. *Biological Psychology, 64*(1-2), 167-190.

Bartl, G., Brandstaetter, C., Hosemann, A., & Reitter, C. (1998). Blickbewegungen und Reaktionen von Fahrern bei sogenannter Minderalkoholisierung. [Eye movements and reactions in drivers with minor alcohol concentrations]. *Blutalkohol, 35*(2), 124-138.

Bartl, G., Lager, F., & Domesle, L. (1996). Testleistungen bei Minderalkoholisierung. [Test performance with minimal alcoholic intoxication]. *Blutalkohol, 33*(1), 1-16.

Beirness, D. J., & Vogel Sprott, M. D. (1982). Does prior skill reduce alcohol-induced impairment? *Journal of Studies on Alcohol, 43*(11), 1149-1156.

Belgrave, B. E., Bird, K. D., Chesher, G. B., Jackson, D. M., Lubbe, K. E., Starmer, G. A., et al. (1979). The effect of (-) trans-delta9-tetrahydrocannabinol, alone and in combination with ethanol, on human performance. *Psychopharmacology, 62*(1), 53-60.

Bennett, R. H., Cherek, D. R., & Spiga, R. (1993). Acute and chronic alcohol tolerance in humans: effects of dose and consecutive days of exposure. *Alcoholism: Clinical and Experimental Research, 17*(4), 740-745.

Berlin, I., Cournot, A., Zimmer, R., Pedarriosse, A. M., Manfredi, R., Molinier, P., et al. (1990). Evaluation and comparison of the interaction between alcohol and moclobemide or clomipramine in healthy subjects. *Psychopharmacology, 100*(1), 40-45.

Billings, C. E., Demosthenes, T., White, T. R., & O'Hara, D. B. (1991). Effects of alcohol on pilot performance in simulated flight. *Aviation, Space and Environmental Medicine, 62*(3), 233-235.

Bird, K. D., Boleyn, T., Chesher, G. B., Jackson, D. M., Starmer, G. A., & Teo, R. K. (1980). Intercannabinoid and cannabinoid-ethanol interactions on human performance. *Psychopharmacology, 71*(2), 181-188.

Bjerver, K., & Goldberg, L. (1950). Effect of alcohol ingestion on driving ability: results of practical road tests and laboratory experiments. *Quarterly Journal of Studies on Alcohol, 11,* 1-30.

Blekher, T., Beard, J. D., O'Connor, S., Orr, W. E., Ramchandani, V. A., Miller, K., et al. (2002). Response of saccadic eye movements to alcohol in African American and non-Hispanic White college students. *Alcoholism: Clinical and Experimental Research, 26*(2), 232-238.

Blekher, T., Miller, K., Yee, R., Christian, J., & Abel, L. (1997). Smooth pursuit in twins before and after alcohol ingestion. *Investigative Ophthalmology and Visual Science , 38*(9), 1768-1773.

Bond, A., & Lader, M. (1991). Does alcohol modify responses to reward in a competitive task? *Alcohol and Alcoholism, 26*(1), 61-69.

Brasser, S. M., McCaul, M. E., & Houtsmuller, E. J. (2004). Alcohol effects during acamprosate treatment: a dose-response study in humans. *Alcoholism: Clinical and Experimental Research, 28*(7), 1074-1083.

Brookhuis, K. A., & de Waard, D. (1993). The use of psychophysiology to assess driver status. *Ergonomics, 36*(9), 1099-1110.

Brown, B., et al. (1975). Effects of alcohol and marijuana on dynamic visual acuity: I. Thresholds measurements. *Perception and Psychophysics, 18*(6), 441-446.

Brumback, T., Cao, D., & King, A. (2007). Effects of alcohol on psychomotor performance and perceived impairment in heavy binge social drinkers. *Drug and Alcohol Dependence, 91*(1), 10-17.

Burford, R., French, I. W., & LeBlanc, A. E. (1975). The combined effects of alcohol and common psychoactive drugs: I. Studies on human pursuit tracking capability. In S. Israelstam & S. Lambert (Eds.), *Alcohol, drugs and traffic safety* (pp. 423-431). Toronto: Addiction Research Foundation.

Burian, S. E., Hensberry, R., & Liguori, A. (2003). Differential effects of alcohol and alcohol expectancy on risk-taking during simulated driving. *Human Psychopharmacology: Clinical and Experimental, 18*(3), 175-184.

Burian, S. E., Liguori, A., & Robinson, J. H. (2002). Effects of alcohol on risk-taking during simulated driving. *Human Psychopharmacology: Clinical and Experimental, 17*(3), 141-150.

Burns, M., & Moskowitz, H. (1980). Effects of diphenhydramine and alcohol on skills performance. *European Journal of Clinical Pharmacology, 17*(4), 259-266.

Burns, M., & Moskowitz, H. (1990). Two experiments on alcohol-caffeine interaction. *Alcohol, Drugs and Driving, 5 & 6*(4 & 1), 303-315.

Calhoun, V. D., Carvalho, K., Astur, R., & Pearlson, G. D. (2005). Using virtual reality to study alcohol intoxication effects on the neural correlates of simulated driving. *Applied Psychophysiology and Biofeedback, 30*(3), 285-306.

Cameron, C. A., Hopper, E. S., & Tiplady, B. (1996). Ethanol and negative priming. *Human Psychopharmacology: Clinical and Experimental, 11*(2), 131-136.

Carpenter, J. A. (1959). The effect of caffeine and alcohol on simple visual reaction time. *Journal of Comparative and Physiological Psychology, 52*, 491-496.

Carpenter, J. A., & Ross, B. M. (1965). Effect of alcohol on short-term memory. *Quarterly Journal of Studies on Alcohol, 26*(4), 561-579.

Casbon, T. S., Curtin, J. J., Lang, A. R., & Patrick, C. J. (2003). Deleterious effects of alcohol intoxication: Diminished cognitive control and its behavioral consequences. *Journal of Abnormal Psychology, 112*(3), 476-487.

Chait, L. D., & Perry, J. L. (1994). Acute and residual effects of alcohol and marijuana, alone and in combination, on mood and performance. *Psychopharmacology 115*(3), 340-349.

Cheong, J., & Nagoshi, C. T. (1999). Effects of Sensation Seeking, Instruction Set, and Alcohol/Placebo Administration on Aggressive Behavior. *Alcohol, 17*(1), 81-86.

Chermack, S. T., & Taylor, S. P. (1995). Alcohol and human physical aggression: Pharmacological versus expectancy effects. *Journal of Studies on Alcohol, 56*(4), 449-456.

Cherry, N., Johnston, J. D., Venables, H., Waldron, H. A., Buck, L., & MacKay, C. J. (1983). The effects of toluene and alcohol on psychomotor performance. *Ergonomics, 26*(11), 1081-1087.

Clarici, A., Fabbro, F., & Bava, A. (1993). Effects of ethyl alcohol on hemispheric specialization of language and on hand movements. *Perceptual and Motor Skills, 77*(3 Pt 2), 1259-1264.

Clarisse, R., Testu, F., & Reinberg, A. (2004). Effects of alcohol on psycho-technical tests and social communication in a festive situation: a chronopsychological approach. *Chronobiology International, 21*(4-5), 721-738.

Clifasefi, S. L., Takarangi, M. K., & Bergman, J. S. (2006). Blind drunk: The effects of alcohol on inattentional blindness. *Applied Cognitive Psychology, 20*(5), 697-704.

Colburn, N., Meyer, R. D., Wrigley, M., & Bradley, E. L. (1993). Should motorcycles be operated within the legal alcohol limits for automobiles. *The Journal of Trauma, 35*(2), 183-186.

Collins, W. E., Schroeder, D. J., Gilson, R. D., & Guedry, F. E., Jr. (1971). Effects of alcohol ingestion on tracking performance during angular acceleration. *J Appl Psychol Journal of Applied Psychology, 55*(6), 559-563.

Colquhoun, W. P., & Edwards, R. S. (1975). Interaction of noise with alcohol on a task of sustained attention. *Ergonomics, 18*(1), 81-87.

Connors, G. J., & Maisto, S. A. (1980). Effects of alcohol, instructions and consumption rate and motor performance. *Journal of Studies on Alcohol, 41*(5), 509-517.

Corbin, W. R., & Cronce, J. M. (2007). Alcohol effects on behavioral control: The impact of likelihood and magnitude of negative consequences. *Alcoholism: Clinical and Experimental Research, 31*(6), 955-964.

Crowdy, K. A., & Marple Horvat, D. E. (2004). Alcohol affects eye movements essential for visually guided stepping. *Alcoholism: Clinical and Experimental Research, 28*(3), 402-407.

Curran, H. V., & Hildebrandt, M. (1999). Dissociative effects of alcohol on recollective experience. *Consciousness and Cognition, 8*(4), 497-509.

Curtin, J. J., & Fairchild, B. A. (2003). Alcohol and cognitive control: Implications for regulation of behavior during response conflict. *Journal of Abnormal Psychology, 112*(3), 424-436.

Curtin, J. J., Patrick, C. J., Lang, A. R., Cacioppo, J. T., & Birbaumer, N. (2001). Alcohol affects emotion through cognition. *Psychological Science, 12*(6), 527-531.

Dalrymple Alford, J. C., Kerr, P., & Jones, R. D. (2003). The effects of alcohol on driving-related sensorimotor performance across four times of day. *Journal of Studies on Alcohol, 64*(1), 93-97.

Davenport, M., & Harris, D. (1992). The effect of low blood alcohol levels of pilot performance in a series of simulated approach and landing trials. *International Journal of Aviation Psychology, 2*(4), 271-280.

de Wit, H., Crean, J., & Richards, J. B. (2000). Effects of d-amphetamine and ethanol on a measure of behavioral inhibition in humans. *Behavioral Neuroscience, 114*(4), 830-837.

de Wit, H., & Doty, P. (1994). Preference for ethanol and diazepam in light and moderate social drinkers: a within-subjects study. *Psychopharmacology, 115*(4), 529-538.

Deery, H. A., & Love, A. W. (1996). The effect of a moderate dose of alcohol on the traffic hazard perception profile of young drink-drivers. *Addiction, 91*(6), 815-827.

Doty, P., & de Wit, H. (1995a). Effect of setting on the reinforcing and subjective effects of ethanol in social drinkers. *Psychopharmacology, 118*(1), 19-27.

Doty, P., & de Wit, H. (1995b). Effects of naltrexone pretreatment on the subjective and performance effects of ethanol in social drinkers. *Behavioural Pharmacology, 6*(4), 386-394.

Dougherty, D. M., Bjork, J. M., Bennett, R. H., & Moeller, F. (1999). The effects of a cumulative alcohol dosing procedure on laboratory aggression in women and men. *Journal of Studies on Alcohol, 60*(3), 322-329.

Dougherty, D. M., Cherek, D. R., & Bennett, R. H. (1996). The effects of alcohol on the aggressive responding of women. *Journal of Studies on Alcohol, 57*(2), 178-186.

Dougherty, D. M., Marsh, D. M., Moeller, F., Chokshi, R. V., & Rosen, V. C. (2000). Effects of moderate and high doses of alcohol on attention, impulsivity, discriminability, and response bias in immediate and delayed memory task performance. *Alcoholism: Clinical and Experimental Research, 24*(11), 1702-1711.

Dougherty, D. M., Moeller, F., Steinberg, J. L., Marsh, D. M., Hines, S. E., & Bjork, J. M. (1999). Alcohol increases commission error rates for a continuous performance test. *Alcoholism: Clinical and Experimental Research, 23*(8), 1342-1351.

Drake, C. L., Roehrs, T., Turner, L., Scofield, H. M., & Roth, T. (2003). Caffeine reversal of ethanol effects on the multiple sleep latency test, memory, and psychomotor performance. *Neuropsychopharmacology, 28*(2), 371-378.

Drew, G. C., Colquhoun, W. P., & Long, H. A. (1959). Effect of small doses of alcohol on a skill resembling driving. *Med Research Council Annual Report, 38*, 1-108.

Duka, T., Weissenborn, R., & Dienes, Z. (2001). State-dependent effects of alcohol on recollective experience, familiarity and awareness on memories. *Psychopharmacology, 153*(3), 295-306.

Easdon, C., Izenberg, A., Armilio, M. L., Yu, H., & Alain, C. (2005). Alcohol consumption impairs stimulus- and error-related processing during a Go/No-Go Task. *Cognitive Brain Research, 25*(3), 873-883.

Easdon, C. M., & Vogel Sprott, M. (1996). Drug-free behavioral history affects social drinkers' tolerance to a challenge dose of alcohol. *Journal of Studies on Alcohol, 57*(6), 591-597.

Easdon, C. M., & Vogel Sprott, M. (2000). Alcohol and behavioral control: impaired response inhibition and flexibility in social drinkers. *Experimental and Clinical Psychopharmacology, 8*(3), 387-394.

Ellinwood, E. H., Jr., Linnoila, M., Easler, M. E., & Molter, D. W. (1981). Onset of peak impairment after diazepam and after alcohol. *Clinical Pharmacology and Therapeutics, 30*(4), 534-538.

Erblich, J., & Earleywine, M. (1995). Distraction does not impair memory during intoxication: Support for the attention-allocation model. *Journal of Studies on Alcohol, 56*(4), 444-448.

Erwin, C. W., Wiener, E. L., Linnoila, M. I., & Truscott, T. R. (1978). Alcohol-induced drowsiness and vigilance performance. *Journal of Studies on Alcohol, 39*(3), 505-516.

Evans, S. M., & Levin, F. R. (2003). Response to alcohol in females with a paternal history of alcoholism. *Psychopharmacology, 169*(1), 10-20.

Evans, S. M., & Levin, F. R. (2004). Differential response to alcohol in light and moderate female social drinkers. *Behavioral Pharmacology, 15*(3), 167-181.

Fagan, D., Tiplady, B., & Scott, D. B. (1994). Effects of ethanol on psychomotor performance under steady-state conditions. *Journal of Psychopharmacology, 8*(2), 75-80.

Fairclough, S. H., & Graham, R. (1999). Impairment of driving performance caused by sleep deprivation or alcohol: A comparative study. *Human Factors, 41*(1), 118-128.

Farquhar, K., Lambert, K., Drummond, G. B., Tiplady, B., & Wright, P. (2002). Effect of ethanol on psychomotor performance and on risk taking behaviour. *Journal of Psychopharmacology, 16*(4), 379-384.

Farre, M., de la Torre, R., Llorente, M., Lamas, X., Ugena, B., Segura, J., et al. (1993). Alcohol and cocaine interactions in humans. *Journal of Pharmacology and Experimental Therapeutics, 266*(3), 1364-1373.

Fillmore, M. T. (1994). The degree of impairment a drinker expects predicts motor skill performance under alcohol and placebo. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 54*(11-B), 5931.

Fillmore, M. T. (2003). Alcohol tolerance in humans is enhanced by prior caffeine antagonism of alcohol-induced impairment. *Experimental and Clinical Psychopharmacology, 11*(1), 9-17.

Fillmore, M. T. (2004). Environmental dependence of behavioral control mechanisms: Effects of alcohol and information processing demands. *Experimental and Clinical Psychopharmacology, 12*(3), 216-223.

Fillmore, M. T., & Blackburn, J. (2002). Compensating for alcohol-induced impairment: Alcohol expectancies and behavioral disinhibition. *Journal of Studies on Alcohol, 63*(2), 237-246.

Fillmore, M. T., Carscadden, J. L., & Vogel Sprott, M. (1998). Alcohol, cognitive impairment and expectancies. *Journal of Studies on Alcohol, 59*(2), 174-179.

Fillmore, M. T., Dixon, M. J., & Schweizer, T. A. (2000). Alcohol affects processing of ignored stimuli in a negative priming paradigm. *Journal of Studies on Alcohol, 61*(4), 571-578.

Fillmore, M. T., Dixon, M. J., & Schweizer, T. A. (2000). Differential effects of alcohol on responses to negatively and positively primed stimuli. *Journal of Studies on Alcohol, 61*(6), 872-880.

Fillmore, M. T., Marczinski, C. A., & Bowman, A. M. (2005). Acute tolerance to alcohol effects on inhibitory and activational mechanisms of behavioral control. *Journal of Studies on Alcohol, 66*(5), 663-672.

Fillmore, M. T., Roach, E. L., & Rice, J. T. (2002). Does caffeine counteract alcohol-induced impairment? The ironic effects of expectancy. *Journal of Studies on Alcohol, 63*(6), 745-754.

Fillmore, M. T., & Van Selst, M. (2002). Constraints on information processing under alcohol in the context of response execution and response suppression. *Experimental and Clinical Psychopharmacology, 10*(4), 417-424.

Fillmore, M. T., & Vogel Sprott, M. (1995a). Behavioral effects of alcohol in novice and experienced drinkers: alcohol expectancies and impairment. *Psychopharmacology, 122*(2), 175-181.

Fillmore, M. T., & Vogel Sprott, M. (1995b). Expectancies about alcohol-induced motor impairment predict individual differences in responses to alcohol and placebo. *Journal of Studies on Alcohol, 56*(1), 90-98.

Fillmore, M. T., & Vogel Sprott, M. (1996). Evidence that expectancies mediate behavioral impairment under alcohol. *Journal of Studies on Alcohol, 57*(6), 598-603.

Fillmore, M. T., & Vogel Sprott, M. (1997). Resistance to cognitive impairment under alcohol: the role of environmental consequences. *Experimental and Clinical Psychopharmacology, 5*(3), 251-255.

Fillmore, M. T., & Vogel Sprott, M. (1998). Behavioral impairment under alcohol: Cognitive and pharmacokinetic factors. *Alcoholism: Clinical and Experimental Research, 22*(7), 1476-1482.

Fillmore, M. T., & Vogel Sprott, M. (2000). Response inhibition under alcohol: Effects of cognitive and motivational conflict. *Journal of Studies on Alcohol, 61*(2), 239-246.

Fillmore, M. T., Vogel Sprott, M., & Gavrilescu, D. (1999). Alcohol effects on intentional behavior: dissociating controlled and automatic influences. *Experimental and Clinical Psychopharmacology, 7*(4), 372-378.

Fillmore, M. T., & Weafer, J. (2004). Alcohol impairment of behavior in men and women. *Addiction, 99*(10), 1237-1246.

Finn, P. R., Justus, A., Mazas, C., & Steinmetz, J. E. (1999). Working memory, executive processes and the effects of alcohol on Go/No-Go learning: Testing a model of behavioral regulation and impulsivity. *Psychopharmacology, 146*(4), 465-472.

Finnigan, F., Hammersley, R., & Cooper, T. (1998). An examination of next-day hangover effects after a 100 mg/100 ml dose of alcohol in heavy social drinkers. *Addiction, 93*(12), 1829-1838.

Finnigan, F., Hammersley, R., & Millar, K. (1995). The effects of expectancy and alcohol on cognitive-motor performance. *Addiction, 90*(5), 661-672.

Flom, M. C., Brown, B., Adams, A. J., & Jones, R. T. (1976). Alcohol and marijuana effects on ocular tracking. *American journal of optometry and physiological optics, 53*(12), 764-773.

Fogarty, J. N., & Vogel Sprott, M. (2002). Cognitive processes and motor skills differ in sensitivity to alcohol impairment. *Journal of Studies on Alcohol, 63*(4), 404-411.

Foo, H., & Lemon, J. (1997). Acute effects of kava, alone or in combination with alcohol, on subjective measures of impairment and intoxication and on cognitive performance. *Drug and Alcohol Review, 16*(2), 147-155.

Forney, R. B., & Hughes, F. W. (1964). Meprobamate, ethanol or meprobamate-ethanol combinations on performance of human subjects under delayed audiofeedback (Daf). *The Journal of Psychology, 57*, 431-436.

Forney, R. B., & Hughes, F. W. (1965). Effect of caffeine and alcohol on performance under stress of audiofeedback. *Quarterly Journal of Studies on Alcohol, 26*, 206-212.

Forney, R. B., Hughes, F. W., & Greatbatch, W. H. (1964). Measurement of attentive motor performance after alcohol. *Percept Mot Skills, 19*, 151-154.

Franks, H. M., Hensley, V. R., Hensley, W. J., Starmer, G. A., & Teo, R. K. (1976). The relationship between alcohol dosage and performance decrement in humans. *Journal of Studies on Alcohol, 37*(3), 284-297.

Franks, H. M., Lawrie, M., Schabinsky, V. V., Starmer, G. A., & Teo, R. K. (1981). Interaction between ethanol and antihistamines: 3. mebhydrolin. *Medical Journal of Australia, 2*(9), 477-479.

Fregly, A. R., Bergstedt, M., & Graybiel, A. (1967). Relationships between blood alcohol, positional alcohol nystagmus and postural equilibrium. *Quarterly Journal of Studies on Alcohol, 28*(1), 11-21.

Frick, U., Rehm, J., Knoll, A., Reifinger, M., & Hasford, J. (2000). Perception of traffic accident risk and decision to drive under light alcohol consumption. A double-blind experimental study. *Journal of Substance Abuse, 11*(3), 241-251.

Fromme, K., Katz, E., & D'Amico, E. (1997). Effects of alcohol intoxication on the perceived consequences of risk taking. *Experimental and Clinical Psychopharmacology, 5*(1), 14-23.

Garfinkel, S. N., Dienes, Z., & Duka, T. (2006). The effect of alcohol and repetition at encoding on implicit and explicit false memories. *Psychopharmacology, 188*(4), 498-508.

Gengo, F., Gabos, C., Straley, C., & Manning, C. (1990). The pharmacodynamics of ethanol: effects on performance and judgment. *Journal of Clinical Pharmacology, 30*(8), 748-754.

George, W. H., Raynor, J. O., & Nochajski, T. H. (1992). Resistance to alcohol impairment of visual-motor performance: does it help to pay attention? *Journal of Studies on Alcohol, 53*(5), 507-513.

Gevins, A., & Smith, M. E. (1999). Detecting transient cognitive impairment with EEG pattern recognition methods. *Aviation, Space, and Environmental Medicine, 70*(10, Sect 1), 1018-1024.

Giancola, P. R. (2002). Irritability, acute alcohol consumption and aggressive behavior in men and women. *Drug and Alcohol Dependence, 68*(3), 263-274.

Giancola, P. R. (2003). The moderating effects of dispositional empathy on alcohol-related aggression in men and women. *Journal of Abnormal Psychology, 112*(2), 275-281.

Giancola, P. R. (2004). Difficult temperament, acute alcohol intoxication, and aggressive behavior. *Drug and Alcohol Dependence, 74*(2), 135-145.

Giancola, P. R., & Zeichner, A. (1995). An investigation of gender differences in alcohol-related aggression. *Journal of Studies on Alcohol, 56*(5), 573-579.

Giancola, P. R., & Zeichner, A. (1997). The biphasic effects of alcohol on human physical aggression. *Journal of Abnormal Psychology, 106*(4), 598-607.

Glencross, D., Hansen, J., & Piek, J. (1995). The effects of alcohol on preparation for expected and unexpected events. *Drug and Alcohol Review, 14*(2), 171-177.

Grant, S. A., Millar, K., & Kenny, G. N. (2000). Blood alcohol concentration and psychomotor effects. *British Journal of Anaesthesia, 85*(3), 401-406.

Grattan, K. E., & Vogel Sprott, M. (2001). Maintaining intentional control of behavior under alcohol. *Alcoholism: Clinical and Experimental Research, 25*(2), 192-197.

Grattan Miscio, K. E., & Vogel Sprott, M. (2005a). Alcohol, intentional control, and inappropriate behavior: Regulation by caffeine or an incentive. *Experimental and Clinical Psychopharmacology, 13*(1), 48-55.

Grattan Miscio, K. E., & Vogel Sprott, M. (2005b). Effects of alcohol and performance incentives on immediate working memory. *Psychopharmacology, 181*(1), 188-196.

Grüner, O., Ludwig, O., & Erbe, H. D. (1970). *Alkoholbedingte Leistungsminderung bei Tag und Nacht.* Konferenzbericht der 5. Internationalen Konferenz über Alkohol und Verkehrssicherheit, Freiburg: Schulz, 43-46.

Grutters, G., Reichelt, J. A., Ritz Timme, S., Thome, M., & Kaatsch, H. J. (2003). Beeinträchtigung der Sicherheit im Schiffsverkehr durch Alkohol. Einfluss auf das Visuelle System. *Ophthalmologe, 100*(5), 391-395.

Guedry, F. E., Jr., Gilson, R. D., Schroeder, D. J., & Collins, W. E. (1975). Some effects of alcohol on various aspects of oculomotor control. *Aviation, Space, and Environmental Medicine, 46*(8), 1008-1013.

Gussler Burkhardt, N. L., & Giancola, P. R. (2005). A further examination of gender differences in alcohol-related aggression. *Journal of Studies on Alcohol, 66*(3), 413-422.

Gustafson, R. (1986a). Alcohol and vigilance performance: effect of small doses of alcohol on simple auditory reaction time. *Perceptual and Motor Skills, 63*(1), 99-102.

Gustafson, R. (1986b). Alcohol and vigilance performance: effect of small doses of alcohol on simple visual reaction time. *Perceptual and Motor Skills, 62*(3), 951-955.

Gustafson, R. (1986c). Alcohol, reaction time, and vigilance settings: importance of length of intersignal interval. *Perceptual and Motor Skills, 63*(2 Pt 1), 424-426.

Gustafson, R. (1986d). Effect of moderate doses of alcohol on simple auditory reaction time in a vigilance setting. *Perceptual and Motor Skills, 62*(3), 683-690.

Gustafson, R. (1986e). Effect of small doses of alcohol and signal intensity on simple auditory reaction time in a monotonous test situation. *Perceptual and Motor Skills, 63*(2 Pt 1), 539-543.

Gustafson, R. (1986f). Visual attentional span as a function of a small dose of alcohol. *Perceptual and Motor Skills, 63*(2 Pt 1), 367-370.

Gustafson, R. (1991a). Aggressive and nonaggressive behavior as a function of alcohol intoxication and frustration in women. *Alcoholism: Clinical and Experimental Research, 15*(5), 886-892.

Gustafson, R. (1991b). Male physical aggression as a function of alcohol intoxication and frustration: Experimental results and methodological considerations. *Alcoholism: Clinical and Experimental Research, 15*(2), 158-164.

Gustafson, R. (1991). Male physical aggression as a function of alcohol, frustration, and subjective mood. *The International Journal of the Addictions, 26*(3), 255-266.

Gustafson, R. (1992). Alcohol and aggression: A replication study controlling for potential confounding variables. *Aggressive Behavior, 18*(1), 21-28.

Gustafson, R., & Kallmen, H. (1990a). Alcohol and the compensation hypothesis: A test with cognitive and psychomotor tasks. *Perceptual and Motor Skills, 71*(3, Pt 2), 1367-1374.

Gustafson, R., & Kallmen, H. (1990b). Effects of alcohol on cognitive performance measured with Stroop's Color Word Test. *Perceptual and Motor Skills, 71*(1), 99-105.

Gustafson, R., & Kallmen, H. (1990c). Effects of alcohol on prolonged cognitive performance measured with Stroop's Color Word Test. *Psychological Reports, 67*(2), 643-650.

Hack, M. A., Choi, S. J., Vijayapalan, P., Davies, R. J. O., & Stradling, J. R. (2001). Comparison of the effects of sleep deprivation, alcohol and obstructive sleep apnoea (OSA) on simulated steering performance. *Respiratory Medicine, 95*(7), 594-601.

Haferland, W., Wegener, R., & Käding, U. (1979). Zur Beeinträchtigung der Fahrtüchtigkeit durch kleine Alkoholdosen im Fahrtrainertest. In: *Arzt und Kraftfahrer. Probleme des Straßenverkehrs interdisziplinär dargestellt* (pp. 81-85). Wien: Verlag der Österreichischen Ärztekammer.

Haffner, J. F., Morland, J., Setekleiv, J., Stromsaether, C. E., Danielsen, A., Frivik, P. T., et al. (1973). Mental and psychomotor effects of diazepam and ethanol. *Acta pharmacologica et toxicologica, 32*(3), 161-178.

Hamilton, P., & Copeman, A. (1970). The effect of alcohol and noise on components of a tracking and monitoring task. *British Journal of Anaesthesia, 61*(2), 149-156.

Hammersley, R., Finnigan, F., & Millar, K. (1998). Verbal expectancies and performance after alcohol. *Addictive Behaviors, 23*(4), 489-496.

Harrison, E. L., & Fillmore, M. T. (2005). Social drinkers underestimate the additive impairing effects of alcohol and visual degradation on behavioral functioning. *Psychopharmacology, 177*(4), 459-464.

Harrison, E. L. R., & Fillmore, M. T. (2005). Are bad drivers more impaired by alcohol? Sober driving precision predicts impairment from alcohol in a simulated driving task. *Accident Analysis & Prevention, 37*(5), 882-889.

Hasenfratz, M., Bunge, A., Dal Pra, G., & Battig, K. (1993). Antagonistic effects of caffeine and alcohol on mental performance parameters. *Pharmacology Biochemistry and Behavior, 46*(2), 463-465.

Hasenfratz, M., Buzzini, P., Cheda, P., & Battig, K. (1994). Temporal relationships of the effects of caffeine and alcohol on rapid information processing. *Pharmacopsychoecologia, 7*(2), 87-96.

Heacock, D., & Wikle, R. (1974). The effect of alcohol and placebo on reaction time and distance judgment. *Journal of General Psychology, 91*(2d Half), 265-268.

Heishman, S. J., Arasteh, K., & Stitzer, M. L. (1997). Comparative effects of alcohol and marijuana on mood, memory, and performance. *Pharmacology, Biochemistry and Behavior, 58*(1), 93-101.

Henry, P. H., Davis, T. Q., Engelken, E. J., Triebwaser, J. H., & Lancaster, M. C. (1974). Alcohol-induced performance decrements assessed by two Link trainer tasks using experienced pilots. *Aerospace Medicine, 45*(10), 1180-1189.

Henry, P. H., Flueck, J. A., Sanford, J. F., Keiser, H. N., McNee, R. C., Walter, W. H., et al. (1974). Assessment of performance in a link GAT-1 flight simulator at three alcohol dose levels. *Aerospace Medicine, 45*(1), 33-44.

Hermanutz, M., & Rief, W. (1994). Der Einfluss von niedrigen Blutalkoholkonzentrationen auf die Aufmerksamkeit Effects of low alcohol levels, practice, and task complexity on reaction time. *Sucht, 40*(2), 80-88.

Hernandez Lopez, C., Farre, M., Roset, P. N., Menoyo, E., Pizarro, N., Ortuno, J., et al. (2002). 3,4-Methylenedioxymethamphetamine (ecstasy) and alcohol interactions in humans: psychomotor performance, subjective effects, and pharmacokinetics. *Journal of Pharmacology and Experimental Therapeutics, 300*(1), 236-244.

Hernandez, O. H., Vogel Sprott, M., Huchin Ramirez, T. C., & Ake Estrada, F. (2006). Acute dose of alcohol affects cognitive components of reaction time to an omitted stimulus: differences among sensory systems. *Psychopharmacology, 184*(1), 75-81.

Hernandez, O. H., Vogel Sprott, M., & Ke Aznar, V. I. (2007). Alcohol impairs the cognitive component of reaction time to an omitted stimulus: a replication and an extension. *Journal of Studies on Alcohol and Drugs, 68*(2), 276-281.

Hewitt, G. P., Holder, M., & Laird, J. (1996). Retrograde enhancement of human kinesthetic memory by alcohol: consolidation or protection against interference? *Neurobiology of Learning and Memory, 65*(3), 269-277.

Higgins, S. T., Rush, C. R., Bickel, W. K., Hughes, J. R., et al. (1993). Acute behavioral and cardiac effects of cocaine and alcohol combinations in humans. *Psychopharmacology, 111*(3), 285-294.

Hill, J. C., & Toffolon, G. (1990). Effect of alcohol on sensory and sensorimotor visual functions. *Journal of Studies on Alcohol, 51*(2), 108-113.

Hiltunen, A. J. (1997). Acute alcohol tolerance in cognitive and psychomotor performance: Influence of the alcohol dose and prior alcohol experience. *Alcohol, 14*(2), 125-130.

Hindmarch, I., Bhatti, J. Z., Starmer, G. A., Mascord, D. J., et al. (1992). The effects of alcohol on the cognitive function of males and females and on skills relating to car driving. *Human Psychopharmacology: Clinical and Experimental, 7*(2), 105-114.

Hindmarch, I., & Gilburt, S. (1990). The lack of CNS effects of nizatidine, with and without alcohol, on psychomotor ability and cognitive function. *Human Psychopharmacology: Clinical and Experimental, 5*(1), 25-32.

Hoaken, P. N. S., Assaad, J. M., & Pihl, R. O. (1998). Cognitive functioning and the inhibition of alcohol-induced aggression. *Journal of Studies on Alcohol, 59*(5), 599-607.

Hoaken, P. N. S., Campbell, T., Stewart, S. H., & Pihl, R. O. (2003). Effects of alcohol on cardiovascular reactivity and the mediation of aggressive behaviour in adult men and women. *Alcohol and Alcoholism, 38*(1), 84-92.

Hoaken, P. N. S., & Pihl, R. O. (2000). The effects of alcohol intoxication on aggressive responses in men and women. *Alcohol and Alcoholism, 35*(5), 471-477.

Holdstock, L., & de Wit, H. (1998). Individual differences in the biphasic effects of ethanol. *Alcoholism: Clinical and Experimental Research, 22*(9), 1903-1911.

Holdstock, L., & de Wit, H. (1999). Ethanol impairs saccadic and smooth pursuit eye movements without producing self-reports of sedation. *Alcoholism: Clinical and Experimental Research, 23*(4), 664-672.

Holdstock, L., & de Wit, H. (2001). Individual differences in responses to ethanol and d-amphetamine: A within-subject study. *Alcoholism: Clinical and Experimental Research, 25*(4), 540-548.

Hollister, L. E., & Gillespie, H. K. (1970). Marihuana, ethanol, and dextroamphetamine. Mood and mental function alterations. *Archives of General Psychiatry, 23*(3), 199-203.

Hopes, H., & Debus, G. (1984). Untersuchungen zu Kombinationseffekten von Oxazolam und Alkohol auf Leistung und Befinden bei gesunden Probanden. *Arzneimittelforschung, 34*(8), 921-926.

Horne, J. A., & Baumber, C. J. (1991). Time-of-day effects of alcohol intake on simulated driving performance in women. *Ergonomics, 34*(11), 1377-1383.

Horne, J. A., & Gibbons, H. (1991). Effects on vigilance performance and sleepiness of alcohol given in the early afternoon ('post lunch') vs. early evening. *Ergonomics, 34*(1), 67-77.

Horne, J. A., Reyner, L. A., & Barrett, P. R. (2003). Driving impairment due to sleepiness is exacerbated by low alcohol intake. *Occupational and Environmental Medicine, 60*(9), 689-692.

Howland, J., Rohsenow, D. J., Cote, J., Gomez, B., Mangione, T. W., & Laramie, A. K. (2001). Effects of low-dose alcohol exposure on simulated merchant ship piloting by maritime cadets. *Accident Analysis and Prevention, 33*(2), 257-265.

Hrouda, P., Astier, A., & Huguenard, P. (1980). Recherche de correlations entre ingestion d'alcool, alcoolemie et troubles du comportement. *Ann Anesthesiol Fr, 21*(2), 170-182.

Hughes, F. W., & Forney, R. B. (1964). Comparative effect of three antihistaminics and ethanol on mental and motor performance. *Clinical Pharmacology and Therapeutics, 26*, 414-421.

Huntley, M. S., Jr. (1973). Effects of alcohol and fixation-task difficulty on choice reaction time to extrafoveal stimulation. *Q Journal of Studies on Alcohol, 34*(1), 89-103.

Hurst, P. M., & Bagley, S. K. (1972). Acute adaptation to the effects of alcohol. *Quarterly Journal of Experimental Psychology, 33*(2), 358-378.

Idestrom, C. M., & Cadenius, B. (1968). Time relations of the effects of alcohol compared to placebo. Dose-response curves for psychomotor and perceptual test performances and blood and urine levels of alcohol. *Psychopharmacologia, 13*(3), 189-200.

Iudice, A., Bonanni, E., Gelli, A., Frittelli, C., Iudice, G., Cignoni, F., et al. (2005). Effects of prolonged wakefulness combined with alcohol and hands-free cell phone divided attention tasks on simulated driving. *Hum Psychopharmacol Human Psychopharmacology: Clinical and Experimental, 20*(2), 125-132.

Jääskeläinen, I. P., Alho, K., Escera, C., Winkler, I., Sillanaukee, P., & Naatanen, R. (1996). Effects of ethanol and auditory distraction on forced choice reaction time. *Alcohol, 13*(2), 153-156.

Jaaskelainen, I. P., Hirvonen, J., Kujala, T., Alho, K., Eriksson, C., Lehtokoski, A., et al. (1998). Effects of naltrexone and ethanol on auditory event-related brain potentials. *Alcohol, 15*(2), 105-111.

Jääskeläinen, I. P., Pekkonen, E., Alho, K., Sinclair, J. D., Sillanaukee, P., & Naatanen, R. (1995). Dose-related effect of alcohol on mismatch negativity and reaction time performance. *Alcohol, 12*(6), 491-495.

Jaaskelainen, I. P., Pekkonen, E., Hirvonen, J., Sillanaukee, P., & Naat anen, R. (1996). Mismatch negativity subcomponents and ethyl alcohol. *Biological Psychology, 43*(1), 13-25.

Jaaskelainen, I. P., Schroger, E., & Naatanen, R. (1999). Electrophysiological indices of acute effects of ethanol on involuntary attention shifting. *Psychopharmacology, 141*(1), 16-21.

Jennings, J., Wood, C. C., & Lawrence, B. E. (1976). Effects of graded doses of alcohol on speed-accuracy tradeoff in choice reaction time. *Perception and Psychophysics, 19*(1), 85-91.

Jones, B. M. (1973). Alcohol and memory impairment: A reinterpretation of the dose-response phenomenon. *Biological Psychology Bulletin*.

Jones, M. B., Chronister, J. L., & Kennedy, R. S. (1998). Effects of alcohol on perceptual speed. *Perceptual and Motor Skills, 87*(3 Pt 2), 1247-1255.

Kelly, T. H., Emurian, C. S., Baseheart, B. J., & Martin, C. A. (1997). Discriminative stimulus effects of alcohol in humans. *Drug and Alcohol Dependence, 48*(3), 199-207.

Kennedy, R. S., Turnage, J. J., Rugotzke, G. G., & Dunlap, W. P. (1994). Indexing cognitive tests to alcohol dosage and comparison to standardized field sobriety tests. *Journal of Studies on Alcohol, 55*(5), 615-628.

Kennedy, R. S., Turnage, J. J., Wilkes, R. L., & Dunlap, W. P. (1993). Effects of graded dosages of alcohol on nine computerized repeated-measures tests. *Ergonomics, 36*(10), 1195-1222.

Kerr, J. S., Sherwood, N., & Hindmarch, I. (1991). Separate and combined effects of the social drugs on psychomotor performance. *Psychopharmacology, 104*(1), 113-119.

Khajuria, V., Kappor, B., & Raina, R. K. (1995). Studies on performance in healthy volunteers after diazepam, propanolol and alcohol given alone or in combination. *Indian Journal of Physiology and Pharmacology, 39*, 242-246.

Khan, S. A., & Timney, B. (2007). Alcohol does not affect dark adaptation or luminance increment thresholds. *Journal of Studies on Alcohol and Drugs, 68*(4), 493-502.

King, A. C., & Byars, J. A. (2004). Alcohol-induced performance impairment in heavy episodic and light social drinkers. *Journal of Studies on Alcohol, 65*(1), 27-36.

King, A. C., Houle, T., de Wit, H., Holdstock, L., & Schuster, A. (2002). Biphasic alcohol response differs in heavy versus light drinkers. *Alcoholism: Clinical and Experimental Research, 26*(6), 827-835.

Kirchner, T. R., & Sayette, M. A. (2003). Effects of alcohol on controlled and automatic memory processes. *Experimental and Clinical Psychopharmacology, 11*(2), 167-175.

Kirk, J. M., & de Wit, H. (2000). Individual differences in the priming effect of ethanol in social drinkers. *Journal of Studies on Alcohol, 61*(1), 64-71.

Klein, K. E., Breuker, K., Bruner, H., & Wegmann, H. M. (1967). Blutalkohol und Fluguntuchtigkeit. Versuch einer Erarbeitung von Richtwerten für die allgemeine Luftfahrt. *Internationale Zeitschrift für Angewandte Physiologie, 24*(3), 254-267.

Klein, R. H., & Jex, H. R. (1975). Effects of alcohol on a Critical Tracking Task. *Journal of Studies on Alcohol, 36*(1), 11-20.

Knowles, S. K. Z., & Duka, T. (2004). Does alcohol affect memory for emotional and non-emotional experiences in different ways? *Behavioural Pharmacology, 15*(2), 111-121.

Kostandov, E. A., Arsumanov, Y. L., Genkina, O. A., Restchikova, T. N., & Shostakovich, G. S. (1982). The effects of alcohol on hemispheric functional asymmetry. *Journal of Studies on Alcohol, 43*(5), 411-426.

Kronsbein, H., Oehmichen, M., & Kompf, D. (1994). Wirkung niedriger Alkoholkonzentrationen auf sakkadische Augenbewegungen. Infrarotreflexionstechnik zur Erfassung okulomotorischer Reaktionen bei Betrachtung gefährlicher Verkehrssituationen. [Effect of low dose alcohol concentration on saccadic eye movements. Infrared reflection technique for recording oculomotor reactions with reference to dangerous traffic situations]. *Blutalkohol, 31*(2), 57-75.

Krull, K. R., Smith, L. T., Kalbfleisch, L. D., & Parsons, O. A. (1992). The influence of alcohol and sleep deprivation on stimulus evaluation. *Alcohol, 9*(5), 445-450.

Krull, K. R., Smith, L. T., & Parsons, O. A. (1994). Simple reaction time event-related potentials: Effects of alcohol and diazepam. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 18*(8), 1247-1260.

Kuypers, K. P. C., Samyn, N., & Ramaekers, J. G. (2006). MDMA and alcohol effects, combined and alone, on objective and subjective measures of actual driving performance and psychomotor function. *Psychopharmacology, 187*(4), 467-475.

Lamers, C. T. J., & Ramaekers, J. G. (2001). Visual search and urban city driving under the influence of marijuana and alcohol. *Human Psychopharmacology: Clinical and Experimental, 16*(5), 393-401.

Lamers, C. T. J., Ramaekers, J. G., Muntjewerff, N. D., Sikkema, K. L., Samyn, N., Read, N. L., et al. (2003). Dissociable effects of a single dose of ecstasy (MDMA) on psychomotor skills and attentional performance. *Journal of Psychopharmacology, 17*(4), 379-387.

Lamond, N., Dorrian, J., Burgess, H., Holmes, A., Roach, G., McCulloch, K., et al. (2004). Adaptation of performance during a week of simulated night work. *Ergonomics, 47*(2), 154-165.

Landauer, A. A. (1981). Alcohol drinking reduces hand tremor. *British Journal of Anaesthesia, 76*(4), 429-430.

Landauer, A. A., & Howat, P. (1983). Low and moderate alcohol doses, psychomotor performance and perceived drowsiness. *Ergonomics, 26*(7), 647-657.

Landauer, A. A., & Howat, P. A. (1982). Alcohol and the cognitive aspects of choice reaction time. *Psychopharmacology, 78*(3), 296-297.

Lane, S. D., Cherek, D. R., Pietras, C. J., & Tcheremissine, O. V. (2004). Alcohol effects on human risk taking. *Psychopharmacology, 172*(1), 68-77.

Laplace, A. C., Chermack, S. T., & Taylor, S. P. (1994). Effects of alcohol and drinking experience on human physical aggression. *Personality and Social Psychology Bulletin, 20*(4), 439-444.

Lapp, W. M., Collins, R. L., Zywiak, W. H., & Izzo, C. V. (1994). Psychopharmacological effects of alcohol on time perception: the extended balanced placebo design. *Journal of Studies on Alcohol, 55*(1), 96-112.

Lau, M. A., Pihl, R. O., & Peterson, J. B. (1995). Provocation, acute alcohol intoxication, cognitive performance, and aggression. *Journal of Abnormal Psychology, 104*(1), 150-155.

Laurell, H. (1977). Effects of small doses of alcohol on driver performance in emergency traffic situations. *Accident Analysis and Prevention, 9*(3), 191-201.

Leigh, G., & Tong, J. E. (1976). Effects of ethanol and tobacco on time judgment. *Perceptual and Motor Skills, 43*(3 pt. 1), 899-903.

Lemon, J., Chesher, G., Fox, A., Greeley, J., & Nabke, C. (1993). Investigation of the "hangover" effects of an acute dose of alcohol on psychomotor performance. *Alcoholism: Clinical and Experimental Research, 17*(3), 665-668.

Lenne, M. G., Dietze, P., Rumbold, G. R., Redman, J. R., & Triggs, T. J. (2003). The effects of the opioid pharmacotherapies methadone, LAAM and buprenorphine, alone and in combination with alcohol, on simulated driving. *Drug and Alcohol Dependence, 72*(3), 271-278.

Lenne, M. G., Triggs, T. J., & Redman, J. R. (1999). Alcohol, Time of Day, and Driving Experience: Effects on Simulated Driving Performance and Subjective Mood. *Transportation Human Factors, 1*(4), 331-346.

Leung, S., & Starmer, G. (2005). Gap acceptance and risk-taking by young and mature drivers, both sober and alcohol-intoxicated, in a simulated driving task. *Accident Analysis and Prevention, In Press, Corrected Proof*.

Lewis, B. A., & Vogeltanz Holm, N. D. (2002). The effects of alcohol and anxiousness on physiological and subjective responses to a social stressor in women. *Addictive Behaviors, 27*(4), 529-545.

Lewis, E. G. (1973). Influence of test length and difficulty level on performance after alcohol. *Quarterly Journal of Experimental Psychology, 34*(1), 78-88.

Lewis, E. G., Dustman, R. E., & Beck, E. C. (1969). The effect of alcohol on sensory phenomena and cognitive and motor tasks. *Quarterly Journal of Experimental Psychology, 30*(3), 618-633.

Lex, B. W., Rhoades, E. M., Teoh, S. K., Mendelson, J. H., & Greenwald, N. E. (1994). Divided attention task performance and subjective effects following alcohol and placebo: differences between women with and without a family history of alcoholism. *Drug and Alcohol Dependence, 35*(2), 95-105.

Liguori, A., D'Agostino, R. B., Jr., Dworkin, S. I., Edwards, D., & Robinson, J. H. (1999). Alcohol effects on mood, equilibrium, and simulated driving. *Alcoholism: Clinical and Experimental Research, 23*(5), 815-821.

Liguori, A., Gatto, C. P., & Jarrett, D. B. (2002). Separate and combined effects of marijuana and alcohol on mood, equilibrium and simulated driving. *Psychopharmacology, 163*(3-4), 399-405.

Liguori, A., & Robinson, J. H. (2001). Caffeine antagonism of alcohol-induced driving impairment. *Drug and Alcohol Dependence, 63*(2), 123-129.

Lindenschmidt, R., Brown, D., Cerimele, B., Walle, T., & Forney, R. B. (1983). Combined effects of propranolol and ethanol on human psychomotor performance. *Toxicology and Applied Pharmacology, 67*(1), 117-121.

Linnoila, M. (1973a). Drug interaction on psychomotor skills related to driving: hypnotics and alcohol. *Annales Medicinae Experimentalis et Biologiae Fenniae, 51*(3), 118-124.

Linnoila, M. (1973b). Effects of diazepam, chlordiazepoxide, thioridazine, haloperidole, flupenthixole and alcohol on psychomotor skills related to driving. *Annales Medicinae Experimentalis et Biologiae Fenniae, 51*(3), 125-132.

Linnoila, M., et al. (1990). Effects of adinazolam and diazepam, alone and in combination with ethanol, on psychomotor and cognitive performance and on autonomic nervous system reactivity in healthy volunteers. *European Journal of Clinical Psychopharmacology, 38*, 371-377.

Linnoila, M., Erwin, C. W., Brendle, A., & Logue, P. (1981). Effects of alcohol and flunitrazepam on mood and performance in healthy young men. *Journal of Clinical Pharmacology, 21*(10), 430-435.

Linnoila, M., Erwin, C. W., Cleveland, W. P., Logue, P. E., & Gentry, W. D. (1978). Effects of alcohol on psychomotor performance of men and women. *Journal of Studies on Alcohol, 39*(5), 745-758.

Linnoila, M., Erwin, C. W., Ramm, D., & Cleveland, W. P. (1980). Effects of age and alcohol on psychomotor performance of men. *Journal of Studies on Alcohol, 41*(5), 488-495.

Linnoila, M., & Hakkinen, S. (1974). Effects of diazepam and codeine, alone and in combination with alcohol, on simulated driving. *Clin Pharmacol Ther Clinical Pharmacology and Therapeutics, 15*(4), 368-373.

Linnoila, M., & Mattila, M. J. (1973). Effects of isoniazid on psychomotor skills related to driving. *Journal of Clinical Pharmacology, 13*(8), 343-350.

Lister, R. G., Gorenstein, C., Risher Flowers, D., Weingartner, H. J., et al. (1991). Dissociation of the acute effects of alcohol on implicit and explicit memory processes. *Neuropsychologia, 29*(12), 1205-1212.

Lubin, R. A. (1979). Influences of alcohol, interpersonal feedback, and drinking experience upon performance and judgment. *Perceptual and Motor Skills, 48*(1), 95-104.

Lukas, S. E., Lex, B. W., Slater, J. P., Greenwald, N. E., & Mendelson, J. H. (1989). A microanalysis of ethanol-induced disruption of body sway and psychomotor performance in women. *Psychopharmacology, 98*(2), 169-175.

Lutze, J., Gelbke, H. P., & Schmidt, G. (1979). Zur Leistungsbeeinträchtigung durch Alkohol und Diazepam. *Zeitschrift für Rechtsmedizin, 82*(4), 327-336.

Lutze, J., & Schacher, E. (1979). Zur Reaktionszeit bei niedrigen Blutalkoholwerten. *Blutalkohol, 16*, 49-58.

Lyon, R. J., Tong, J. E., Leigh, G., & Clare, G. (1975). The influence of alcohol and tobacco on the components of choice reaction time. *Journal of Studies on Alcohol, 36*(5), 587-596.

Lyvers, M. F., & Maltzman, I. (1991). Selective effects of alcohol on Wisconsin Card Sorting Test performance. *British Journal of Addiction, 86*(4), 399-407.

MacArthur, R. D., & Sekuler, R. (1982). Alcohol and motion perception. *Perception and Psychophysics, 31*(5), 502-505.

Macavoy, M. G., & Marks, D. F. (1975). Divided attention performance of cannabis users and non-users following cannabis and alcohol. *Psychopharmacologia, 44*(2), 147-152.

Mackay, M., Tiplady, B., & Scholey, A. B. (2002). Interactions between alcohol and caffeine in relation to psychomotor speed and accuracy. *Human Psychopharmacology: Clinical and Experimental, 17*(3), 151-156.

Mann, R. E., Cho Young, J., & Vogel Sprott, M. (1984). Retrograde enhancement by alcohol of delayed free recall performance. *Pharmacology Biochemistry and Behavior, 20*(4), 639-642.

Mann, R. E., & Vogel Sprott, M. (1981). Control of alcohol tolerance by reinforcement in nonalcoholics. *Psychopharmacology, 75*(3), 315-320.

Marczinski, C. A., Abroms, B. D., Van Selst, M., & Fillmore, M. T. (2005). Alcohol-induced impairment of behavioral control: Differential effects on engaging vs. disengaging responses. *Psychopharmacology, 182*(3), 452-459.

Marczinski, C. A., Combs, S. W., & Fillmore, M. T. (2007). Increased sensitivity to the disinhibiting effects of alcohol in binge drinkers. *Psychology of Addictive Behaviors, 21*(3), 346-354.

Marczinski, C. A., & Fillmore, M. T. (2003a). Dissociative antagonistic effects of caffeine on alcohol-induced impairment of behavioral control. *Experimental and Clinical Psychopharmacology, 11*(3), 228-236.

Marczinski, C. A., & Fillmore, M. T. (2003b). Preresponse cues reduce the impairing effects of alcohol on the execution and suppression of responses. *Experimental and Clinical Psychopharmacology, 11*(1), 110-117.

Marczinski, C. A., & Fillmore, M. T. (2005a). Alcohol increases reliance on cues that signal acts of control. *Experimental and Clinical Psychopharmacology, 13*(1), 15-24.

Marczinski, C. A., & Fillmore, M. T. (2005b). Compensating for alcohol-induced impairment of control: Effects on inhibition and activation of behavior. *Psychopharmacology, 181*(2), 337-346.

Marczinski, C. A., & Fillmore, M. T. (2006). Clubgoers and their trendy cocktails: implications of mixing caffeine into alcohol on information processing and subjective reports of intoxication. *Experimental and Clinical Psychopharmacology, 14*(4), 450-458.

Marinkovic, K., Halgren, E., Klopp, J., & Maltzman, I. (2000). Alcohol effects on movement-related potentials: A measure of impulsivity? *Journal of Studies on Alcohol, 61*(1), 24-31.

Marinkovic, K., Halgren, E., & Maltzman, I. (2004). Effects of alcohol on verbal processing: An event-related potential study. *Alcoholism: Clinical and Experimental Research, 28*(3), 415-423.

Marks, D. F., & MacAvoy, M. G. (1989). Divided attention performance in cannabis users and non-users following alcohol and cannabis separately and in combination. *Psychopharmacology, 99*(3), 397-401.

Marsden, G., & Leach, J. (2000). Effects of alcohol and caffeine on maritime navigational skills. *Ergonomics, 43*(1), 17-26.

Martin, F. H., & Garfield, J. (2006). Combined effects of alcohol and caffeine on the late components of the event-related potential and on reaction time. *Biological Psychology, 71*(1), 63-73.

Martin, G. L. (1971). The effects of small doses of alcohol on a simulated driving task. *Journal of Safety Research, 3*(1), 21-27.

Mattila, M. J., Vanakoski, J., Kalska, H., & Seppala, T. (1998). Effects of alcohol, zolpidem, and some other sedatives and hypnotics on human performance and memory. *Pharmacology, Biochemistry and Behavior, 59*(4), 917-923.

Maylor, E. A., Rabbit, P. M., James, G. H., & Kerr, S. A. (1990). Effects of alcohol and extended practice on divided-attention performance. *Perception and Psychophysics, 48*(5), 445-452.

Maylor, E. A., Rabbitt, P. M., James, G. H., & Kerr, S. A. (1990). Comparing the effects of alcohol and intelligence on text recall and recognition. *British Journal of Psychology, 81*(3), 299-313.

Maylor, E. A., Rabbitt, P. M., James, G. H., & Kerr, S. A. (1992). Effects of alcohol, practice and task complexity on reaction time distributions. *Quarterly Journal of Experimental Psychology, 44*(1), 119-139.

McCaul, M. E., Wand, G. S., Eissenberg, T., Rohde, C. A., & Cheskin, L. J. (2000). Naltrexone alters subjective and psychomotor responses to alcohol in heavy drinking subjects. *Neuropsychopharmacology, 22*(5), 480-492.

McMillen, D. L., Smith, S. M., & Wells Parker, E. (1989). The effects of alcohol, expectancy, and sensation seeking on driving risk taking. *Addictive Behaviors, 14*(4), 477-483.

McMillen, D. L., & Wells Parker, E. (1987). The effect of alcohol consumption on risk-taking while driving. *Addictive Behaviors, 12*(3), 241-247.

Meier, S. E., Brigham, T. A., Ward, D. A., & Myers, F. (1995). Effects of blood alcohol concentrations on negative punishment: Implications for decision making. *Journal of Studies on Alcohol, 57*(1), 85-96.

Milani, R., & Curran, H. (2000). Effects of a low dose of alcohol on recollective experience of illusory memory. *Psychopharmacology, 147*(4), 397-402.

Millar, K., Finnigan, F., & Hammersley, R. H. (1999). Is residual impairment after alcohol an effect of repeated performance? *Aviation, Space, and Environmental Medicine, 70*(2), 124-130.

Millar, K., Hammersley, R. H., & Finnigan, F. (1992). Reduction of alcohol-induced performance impairment by prior ingestion of food. *British Journal of Psychology, 83*(Pt 2), 261-278.

Millar, S. A., Duncan, L., & Tiplady, B. (1995). Ethanol-induced CNS depression and divided attention. *Human Psychopharmacology: Clinical and Experimental, 10*(4), 327-331.

Miller, R. J. (1991). The effect of ingested alcohol on fusion latency at various viewing distances. *Perception and Psychophysics, 50*(6), 575-583.

Mills, K. C., & Bisgrove, E. Z. (1983). Cognitive impairment and perceived risk from alcohol. Laboratory, self-report and field assessments. *Journal of Studies on Alcohol, 44*(1), 26-46.

Mills, K. C., Parkman, K. M., & Spruill, S. E. (1996). A PC-based software test for measuring alcohol and drug effects in human subjects. *Alcoholism: Clinical and Experimental Research, 20*(9), 1582-1591.

Milner, G., & Landauer, A. A. (1971). Alcohol, thioridazine and chlorpromazine effects on skills related to driving behaviour. *Journal of Psychiatry, 118*(544), 351-352.

Milner, G., & Landauer, A. A. (1973). Haloperidol and diazepam, alone and together with alcohol, in relation to driving safety. *Blutalkohol, 10*, 247-254.

Mintzer, M. Z., & Griffiths, R. R. (2001). Alcohol and false recognition: A dose-effect study. *Psychopharmacology, 159*(1), 51-57.

Mintzer, M. Z., & Griffiths, R. R. (2002). Alcohol and triazolam: Differential effects on memory, psychomotor performance and subjective ratings of effects. *Behavioural Pharmacology, 13*(8), 653-658.

Miyao, M., Ishikawa, H., Ito, M., Teo, P. C., et al. (1994). Effect of a low dose of alcohol on dynamic visual acuity. *Perceptual and Motor Skills, 78*(3, Pt 1), 963-967.

Molander, L., & Duvhok, C. (1976). Acute effects of oxazepam, diazepam and methylperone, alone and in combination with alcohol on sedation, coordination and mood. *Acta pharmacologica et toxicologica, 38*(2), 145-160.

Morland, J., Setekleiv, J., Haffner, J. F., Stromsaether, C. E., Danielsen, A., & Wethe, G. H. (1974). Combined effects of diazepam and ethanol on mental and psychomotor functions. *Acta pharmacologica et toxicologica, 34*(1), 5-15.

Morrow, D., Leiber, V. O., & Yesavage, J. (1990). The influence of alcohol and aging on radio communication during flight. *Aviation, Space, and Environmental Medicine, 61*(1), 12-20.

Morrow, D., Leirer, V., Yesavage, J., & Tinklenberg, J. (1991). Alcohol, age, and piloting: judgement, mood, and actual performance. *International Journal of the Addictions, 26*(6), 669-683.

Morrow, D., Yesavage, J. A., Leirer, V., Dolhert, N., et al. (1993). The time-course of alcohol impairment of general aviation pilot performance in a Frasca 141 simulator. *Aviation, Space, and Environmental Medicine, 64*(8), 697-705.

Mortimer, R. G. (1963). Effect of low blood-alcohol concentrations in simulated day and night driving. *Perceptual and Motor Skills, 17*, 399-408.

Moser, A., Heide, W., & Kömpf, D. (1998). The effect of oral ethanol consumption on eye movements in healthy volunteers. *Journal of Neurology, 245*(8), 542-550.

Moskowitz, H., & Burns, M. (1973). Alcohol effects on information processing time with an overlearned task. *Perceptual and Motor Skills, 37*(3), 835-839.

Moskowitz, H., & Burns, M. (1981). The effects of alcohol and caffeine, alone and in combination, on skills performance. In L. Goldberg (Ed.), *Alcohol, drugs and traffic safety* (Vol. 3, pp. 969-983). Stockholm: Almquist and Wiksell.

Moskowitz, H., & Depry, D. (1968). Differential effect of alcohol on auditory vigilance and divided-attention tasks. *Quarterly Journal of Studies on Alcohol*. *29,* 54-63.

Moskowitz, H., & Murray, J. T. (1976). Alcohol and backward masking of visual information. *Journal of Studies on Alcohol, 37*(1), 40-45.

Moskowitz, H., & Roth, S. (1971). Effect of alcohol on response latency in object naming. *Quarterly Journal of Studies on Alcohol, 32*(4), 969-975.

Moskowitz, H., & Sharma, S. (1974). Effects of alcohol on peripheral vision as a function of attention. *Human Factors, 16*(2), 174-180.

Moskowitz, H., Ziedman, K., & Sharma, S. (1976). Visual search behavior while viewing driving scenes under the influence of alcohol and marihuana. *Human Factors, 18*(5), 417-431.

Mulvihill, L. E., Skilling, T. A., & Vogel Sprott, M. (1997). Alcohol and the ability to inhibit behavior in men and women. *Journal of Studies on Alcohol, 58*(6), 600-605.

Mungas, D., Ehlers, C. L., & Wall, T. L. (1994). Effects of acute alcohol administration on verbal and spatial learning. *Alcohol and Alcoholism, 29*(2), 163-169.

Nachreiner, F., Grzech Sukalo, H., & Baer, K. (1985). Alkoholwirkungen bei Signalentdeckungsleistungen. *Zeitschrift für Arbeitswissenschaft, 39*, 237-247.

Nagoshi, C. T., Noll, R. T., & Wood, M. D. (1992). Alcohol expectancies and behavioral and emotional responses to placebo versus alcohol administration. *Alcoholism: Clinical and Experimental Research, 16*(2), 255-260.

Neill, R. A., Delahunty, A. M., & Fenelon, B. (1990). Discrimination of motion in depth trajectory following acute alcohol ingestion. *Biological Psychology, 31*(1), 1-22.

Newman, D., Speake, D. J., Armstrong, P. J., & Tiplady, B. (1997). Effects of ethanol on control of attention. *Human Psychopharmacology: Clinical and Experimental, 12*(3), 235-241.

Nicholson, M. E., Andre, J. T., Tyrrell, R. A., Wage, M., et al. (1995). Effects of moderate dose alcohol on visual contrast sensitivity for stationary and moving targets. *Journal of Studies on Alcohol, 56*(3), 261-266.

Nicholson, M. E., Wang, M., Airhihenbuwa, C. O., Mahoney, B. S., Christina, R., & Maney, D. W. (1992). Variability in behavioral impairment involved in the rising and falling BAC curve. *Journal of Studies on Alcohol, 53*(4), 349-356.

Nicholson, M. E., Wang, M., Airhihenbuwa, C. O., Mahoney, B. S., et al. (1992). Predicting alcohol impairment: Perceived intoxication versus BAC. *Alcoholism: Clinical and Experimental Research, 16*(4), 747-750.

Nordby, K., Watten, R. G., Raanaas, R. K., & Magnussen, S. (1999). Effects of moderate doses of alcohol on immediate recall of numbers: Some implications for information technology. *Journal of Studies on Alcohol, 60*(6), 873-878.

Nuotto, E., Mattila, M. J., Seppala, T., & Konno, K. (1982). Coffee and caffeine and alcohol effects on psychomotor function. *Clinical Pharmacology & Therapeutics, 31*(1), 68-76.

Nuotto, E. J., & Korttila, K. (1991). Evaluation of a new computerized psychomotor test battery: Effects of alcohol. *Pharmacology and Toxicology, 68*(5), 360-365.

Oei, T. P., & Kerschbaumer, D. M. (1990). Peer attitudes, sex, and the effects of alcohol on simulated driving performance. *American Journal of Drug and Alcohol Abuse, 16*(1-2), 135-146.

Ortner, C. N. M., MacDonald, T. K., & Olmstead, M. C. C. (2003). Alcohol intoxication reduces impulsivity in the delay-discounting paradigm. *Alcohol and Alcoholism, 38*(2), 151-156.

Osborne, D. J., & Rogers, Y. (1983). Interactions of alcohol and caffeine on human reaction time. *Aviation, Space, and Environmental Medicine, 54*(6), 528-534.

Oxley, J., Lenne, M., & Corben, B. (2006). The effect of alcohol impairment on road-crossing behaviour. *Transportation Research Part F: Traffic Psychology and Behaviour, 9*(4), 258-268.

Palva, E. S., Linnoila, M., Routledge, P., & Seppala, T. (1982). Actions and interactions of diazepam and alcohol on psychomotor skills in young and middle-aged subjects. *Acta pharmacologica et toxicologica, 50*(5), 363-369.

Palva, E. S., Linnoila, M., Saario, I., & Mattila, M. J. (1979). Acute and subacute effects of diazepam on psychomotor skills: interaction with alcohol. *Acta pharmacologica et toxicologica, 45*(4), 257-264.

Papineau, K. L., Roehrs, T. A., Petrucelli, N., Rosenthal, L. D., & Roth, T. (1998). Electrophysiological assessment (The Multiple Sleep Latency Test) of the biphasic effects of ethanol in humans. *Alcoholism: Clinical and Experimental Research, 22*(1), 231-235.

Parent, E. C., & Newman, D. L. (1999). The role of sensation-seeking in alcohol use and risk-taking behavior among college women. *Journal of Alcohol and Drug Education, 44*(2), 12-28.

Parker, E. S., Birnbaum, I. M., & Noble, E. P. (1976). Alcohol and memory: Storage and state dependency. *Journal of Verbal Learning and Verbal Behavior, 15*(6), 691-702.

Parrott, D. J., & Giancola, P. R. (2004). A further examination of the relation between trait anger and alcohol-related aggression: The role of anger control. *Alcoholism: Clinical and Experimental Research, 28*(6), 855-864.

Parrott, D. J., & Zeichner, A. (2002). Effects of alcohol and trait anger on physical aggression in men. *Journal of Studies on Alcohol, 63*(2), 196-204.

Pearson, P., & Timney, B. (1998). Effects of moderate blood alcohol concentrations on spatial and temporal contrast sensitivity. *Journal of Studies on Alcohol, 59*(2), 163-173.

Pearson, P., & Timney, B. (1999). Alcohol does not affect visual contrast gain mechanisms. *Visual Neuroscience, 16*(4), 675-680.

Pearson, P. M. (1999). The effects of ethyl alcohol on visual and auditory thresholds. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(7-B), 3759.

Peeke, S. C., Callaway, E., Jones, R. T., Stone, G. C., & Doyle, J. (1980). Combined effects of alcohol and sleep deprivation in normal young adults. *Psychopharmacology, 67*(3), 279-287.

Perez Reyes, M., White, W. R., McDonald, S. A., & Hicks, R. E. (1992). Interaction between ethanol and dextroamphetamine: effects on psychomotor performance. *Alcoholism: Clinical and Experimental Research, 16*(1), 75-81.

Peterson, J. B., Rothfleisch, J., Zelazo, P. D., & Pihl, R. O. (1990). Acute alcohol intoxication and cognitive functioning. *Journal of Studies on Alcohol, 51*(2), 114-122.

Pickworth, W. B., Klein, S. A., George, F. R., & Henningfield, J. E. (1992). Acetaminophen fails to inhibit ethanol-induced subjective effects in human volunteers. *Pharmacology Biochemistry and Behavior , 41*(1), 189-194.

Pihl, R. O., Lau, M. L., & Assaad, J. M. (1997). Aggressive disposition, alcohol, and aggression. *Aggressive Behavior, 23*(1), 11-18.

Pihl, R. O., Paylan, S. S., Gentes Hawn, A., & Hoaken, P. N. S. (2003). Alcohol affects executive cognitive functioning differentially on the ascending versus descending limb of the blood alcohol concentration curve. *Alcoholism: Clinical and Experimental Research, 27*(5), 773-779.

Post, R. B., Chaderjian, M. R., & Maddock, R. J. (2000). Effects of alcohol on exogenous precueing of attention. *Journal of Studies on Alcohol, 61*(2), 232-238.

Post, R. B., Lott, L. A., Maddock, R. J., & Beede, J. I. (1996). An effect of alcohol on the distribution of spatial attention. *Journal of Studies on Alcohol, 57*(3), 260-266.

Price, D. L., & Flax, R. A. (1982). Alcohol, task difficulty, and incentives in drill press operation. *Human Factors, 24*(5), 573-579.

Quillian, W. C., Cox, D. J., Kovatchev, B. P., & Phillips, C. (1999). The effects of age and alcohol intoxication on simulated driving performance, awareness and self-restraint. *Age Ageing, 28*(1), 59-66.

Ramaekers, J. G., & Kuypers, K. P. (2006). Acute effects of 3,4-methylenedioxymethamphetamine (MDMA) on behavioral measures of impulsivity: alone and in combination with alcohol. *Neuropsychopharmacology, 31*(5), 1048-1055.

Ramaekers, J. G., Kuypers, K. P. C., Wood, C. M., Hockey, G. R. J., Jamson, S., Jamson, H., et al. (2004). *Experimental studies on the effects of licit and illicit drugs on driving performance, psychomotor skills and cognition.* Paper presented at the Immortal, Wien.

Ramaekers, J. G., Muntjewerff, N. D., Uiterwijk, M. M. C., van Veggel, L. M. A., et al. (1996). A study of the pharmacodynamic interaction between befloxatone and ethanol on performance and mood in healthy volunteers. *Journal of Psychopharmacology, 10*(4), 288-294.

Ramaekers, J. G., Robbe, H. W. J., & O'Hanlon, J. F. (2000). Marijuana, alcohol and actual driving performance. *Human Psychopharmacology: Clinical and Experimental, 15*(7), 551-558.

Rammsayer, T. (1995). Extraversion and alcohol: Eysenck's drug postulate revisited. *Neuropsychobiology, 32*(4), 197-207.

Reichelt, J. A., Grutters, G., Ritz Timme, S., Grutters, M., & Kaatsch, H. J. (2003). Beeinträchtigung der Sicherheit im Schiffsverkehr durch Alkohol. Pupillographie und Augenbewegungsmessungen. [Impairment of safety in navigation caused by alcohol: pupillography and measurement of pupil movements]. *Ophthalmologe, 100*(5), 396-401.

Reynolds, B., Richards, J. B., & de Wit, H. (2006). Acute-alcohol effects on the Experiential Discounting Task (EDT) and a question-based measure of delay discounting. *Pharmacology, Biochemistry and Behavior, 83*(2), 194-202.

Richter, R., & Hobi, V. (1979). Der Einfluß niedriger Alkoholmengen auf Psychomotorik und Aufmerksamkeit. *Blutalkohol, 16*, 384-394.

Roache, J. D., Cherek, D. R., Bennett, R. H., Schenkler, J. C., & Cowan, K. A. (1993). Differential effects of triazolam and ethanol on awareness, memory, and psychomotor performance. *Journal of Clinical Psychopharmacology, 13*(1), 3-15.

Roache, J. D., Spiga, R., & Burt, D. B. (1993). Triazolam and ethanol effects on human matching-to-sample performance vary as a function of pattern size and discriminability. *Drug and Alcohol Dependence, 32*(3), 219-229.

Robbe, H. (1998). Marijuana's impairing effects on driving are moderate when taken alone but severe when combined with alcohol. *Human Psychopharmacology: Clinical and Experimental, 13*(Suppl 2), S70-S78.

Robinson, G. H., & Peebles, W. J. (1974). Interactions between alcohol, task difficulty, and compatibility in a choice-reaction task. *Perceptual and Motor Skills, 38*(2), 459-466.

Roehrs, T., Beare, D., Zorick, F., & Roth, T. (1994). Sleepiness and ethanol effects on simulated driving. *Alcoholism: Clinical and Experimental Research, 18*(1), 154-158.

Roehrs, T., Burduvali, E., Bonahoom, A., Drake, C., & Roth, T. (2003). Ethanol and Sleep Loss: A "Dose" Comparison of Impairing Effects. *Sleep: Journal of Sleep and Sleep Disorders Research, 26*(8), 981-985.

Roehrs, T., Claiborue, D., Knox, M., & Roth, T. (1994). Residual sedating effects of ethanol. *Alcoholism: Clinical and Experimental Research, 18*(4), 831-834.

Roehrs, T., Greenwald, M., & Roth, T. (2004). Risk-taking behavior: effects of ethanol, caffeine, and basal sleepiness. *Sleep: Journal of Sleep and Sleep Disorders Research, 27*(5), 887-893.

Roehrs, T., Petrucelli, N., & Roth, T. (1996). Sleep restriction, ethanol effects and time of day. *Human Psychopharmacology: Clinical and Experimental, 11*(3), 199-204.

Roehrs, T., Rosenthal, L., Koshorek, G., Mangano, R. M., & Roth, T. (2001). Effects of zaleplon or triazolam with or without ethanol on human performance. *Sleep Medicine, 2*(4), 323-332.

Roehrs, T., Zwyghuizen Doorenbos, A., Timms, V., Zorick, F., & Roth, T. (1989). Sleep extension, enhanced alertness and the sedating effects of ethanol. *Pharmacology Biochemistry and Behavior, 34*(2), 321-324.

Roehrs, T., Zwyghuizen Doorenbos, A., Zwyghuizen, H., & Roth, T. (1990). Sedating effects of ethanol after a nap. *Alcohol, Drugs and Driving, 5 & 6*(4 & 1), 351-356.

Roehrs, T. A., Zwyghuizen-Doorenbos, A., Knox, M., Moskowitz, H., et al. (1992). Sedating effects of ethanol and time of drinking. *Alcoholism: Clinical and Experimental Research, 16*(3), 553-557.

Ross, L. E., & Mughni, W. N. (1995). Effect of alcohol on the threshold for detecting angular acceleration. *Aviation, Space, and Environmental Medicine, 66*(7), 635-640.

Ross, L. E., Yeazel, L. M., & Chau, A. W. (1992). Pilot performance with blood alcohol concentrations below 0.04%. *Aviation, Space, and Environmental Medicine, 63*(11), 951-956.

Rundell, O. H., & Williams, H. L. (1979). Alcohol and speed-accuracy tradeoff. *Human Factors, 21*(4), 433-443.

Rupp, T. L., Acebo, C., Seifer, R., & Carskadon, M. A. (2007). Effects of a moderate evening alcohol dose. II: Performance. *Alcoholism: Clinical and Experimental Research, 31*(8), 1365-1371.

Rupp, T. L., Acebo, C., Van Reen, E., & Carskadon, M. A. (2007). Effects of a moderate evening alcohol dose. I: Sleepiness. *Alcoholism: Clinical and Experimental Research, 31*(8), 1358-1364.

Rush, C. R., Higgins, S. T., Hughes, J. R., Bickel, W. K., et al. (1993). Acute behavioral and cardiac effects of alcohol and caffeine, alone and in combination, in humans. *Behavioural Pharmacology, 4*(6), 562-572.

Saario, I. (1976). Psychomotor skills during subacute treatment with thioridazine and bromazepam, and their combined effects with alcohol. *Annals of clinical research, 8*(2), 117-123.

Saario, I., & Linnoila, M. (1976). Effect of subacute treatment with hypnotics, alone or in combination with alcohol, on psychomotor skills related to driving. *Acta pharmacologica et toxicologica, 38*(4), 382-392.

Saario, I., Linnoila, M., & Maki, M. (1975). Interaction of drugs with alcohol on human psychomotor skills related to driving: Effect of sleep deprivation or two weeks' treatment with hypnotics. *Journal of Clinical Pharmacology, 15*(Pt 1), 52-59.

Savolainen, K., Riihimaki, V., Vaheri, E., & Linnoila, M. (1980). Effects of xylene and alcohol on vestibular and visual functions in man. *Scandinavian Journal of Work, Environment and Health, 6*(2), 94-103.

Sayette, M. A., Kirchner, T. R., Moreland, R. L., Levine, J. M., & Travis, T. (2004). Effects of alcohol on risk-seeking behavior: A group-level analysis. *Psychology of Addictive Behaviors, 18*(2), 190-193.

Sayette, M. A., Wilson, G., & Elias, M. J. (1993). Alcohol and aggression: A social information processing analysis. *Journal of Studies on Alcohol, 54*(4), 399-407.

Schippers, G. M., De Boer, M. C., Van der Staak, C. P. F., & Cox, W. (1997). Effects of alcohol and expectancy on self-disclosure and anxiety in male and female social drinkers. *Addictive Behaviors, 22*(3), 305-314.

Schmal, F., Kunz, R., Ortmann, C., Stoll, W., Nieschalk, M., & Fechner, G. (2000). Effect of ethanol on dynamic visual acuity during vertical body oscillation in healthy volunteers. *European Archives of Otorhinolaryngolog, 257*(9), 485-489.

Schneider, E. W., & Carpenter, J. A. (1969). The influence of ethanol on auditory signal detection. *Quarterly Journal of Experimental Psychology, 30*(2), 357-370.

Schulte, T., Müller-Oehring, E. M., Strasburger, H., Warzel, H., & Sabel, B. A. (2001). Acute effects of alcohol on divided and covert attention in men. *Psychopharmacology, 154*(1), 61-69.

Schweizer, T. A., Vogel Sprott, M., Danckert, J., Roy, E. A., Skakum, A., & Broderick, C. E. (2006). Neuropsychological profile of acute alcohol intoxication during ascending and descending blood alcohol concentrations. *Neuropsychopharmacology, 31*(6), 1301-1309.

Schweizer, T. A., Vogel Sprott, M., Dixon, M. J., & Jolicoeur, P. (2005). The stage-specific effect of alcohol on human information processing. *Psychopharmacology, 178*(1), 52-57.

Seppala, T., Leino, T., Linnoila, M., Huttunen, M., & Ylikahri, R. (1976). Effects of hangover on psychomotor skills related to driving: modification by fructose and glucose. *Acta pharmacologica et toxicologica, 38*(3), 209-218.

Seppala, T., Nuotto, E., & Dreyfus, J. F. (1982). Drug-alcohol interactions on psychomotor skills: zopiclone and flunitrazepam. *International Pharmacopsychiatry, 17*(Suppl 2), 127-135.

Seppala, T., Palva, E., Mattila, M. J., Korttila, K., & Shrotriya, R. C. (1980). Tofisopam, a novel 3,4-benzodiazepine: multiple-dose effects on psychomotor skills and memory. Comparison with diazepam and interactions with ethanol. *Psychopharmacology, 69*(2), 209-218.

Sexton, B. F., Tunbridge, R. J., Board, A., Jackson, P. G., & al. (2002). *The influence of cannabis and alcohol on driving*: TRL.

Smith, L. T., Sinha, R., & Williams, H. L. (1990). The interaction of alcohol and sleep deprivation in two reaction time tasks. *Alcohol, Drugs and Driving, 5 & 6*(4 & 1), 341-350.

Soderpalm, A. H. V., & de Wit, H. (2002). Effects of stress and alcohol on subjective state in humans. *Alcoholism: Clinical and Experimental Research, 26*(6), 818-826.

Sommer, W., Leuthold, H., & Hermanutz, M. (1993). Covert effects of alcohol revealed by event-related potentials. *Perception and Psychophysics, 54*(1), 127-135.

Staak, M., Springer, E., & Schoor, P. (1972). Experimentelle Untersuchungen über objektiv meßbare Wirkungen niedriger Blutalkoholkonzentrationen im Doppelblindversuch. *Blutalkohol, 9*, 441-450.

Stewart, S. H., & Pihl, R. O. (1994). Effects of alcohol administration on psychophysiological and subjective-emotional responses to aversive stimulation in anxiety-sensitive women. *Psychology of Addictive Behaviors, 8*(1), 29-42.

Streufert, S., Pogash, R., Roache, J., Severs, W., et al. (1994). Alcohol and management performance. *Journal of Studies on Alcohol, 55*(2), 230-238.

Streufert, S., Pogash, R. M., Gingrich, D., Kantner, A., et al. (1993). Alcohol and complex functioning. *Journal of Applied Social Psychology, 23*(11), 847-866.

Streufert, S., Pogash, R. M., Roache, J. D., Gingrich, D., et al. (1992). Effects of alcohol intoxication on risk taking, strategy, and error rate in visuomotor performance. *Journal of Applied Psychology, 77*(4), 515-524.

Strohbeck Kuehner, P. (1998). Alkoholinduzierte Aufmerksamkeitsstoerungen: Auswirkungen von Alkoholgewoehnung und Aktivierung. [Alcohol-induced impaired attention: Effects of alcohol habituation and activation]. *Blutalkohol, 35*(6), 434-446.

Strohbeck Kuehner, P., & Thieme, C. M. (1998). Alkoholinduzierte Wahrnehmungsstoerungen im Gesichtsfeld: Effekte und Artefakte Alcohol-induced perceptual distortions in the visual field: Effects and artifacts. *Blutalkohol, 35*(3), 183-194.

Sturgis, S. P., & Mortimer, R. G. (1973). Effects of practice and alcohol on selected skills: implications for an automobile alcohol ignition interlock. *Perceptual and Motor Skills, 37*(1), 267-274.

Taberner, P. V. (1980). Sex differences in the effects of low doses of ethanol on human reaction time. *Psychopharmacology, 70*(3), 283-286.

Tagawa, M., Kano, M., Okamura, N., Itoh, M., Sakurai, E., Watanabe, T., et al. (2000). Relationship between effects of alcohol on psychomotor performances and blood alcohol concentrations. *Japanese Journal of Pharmacology, 83*(3), 253-260.

Taylor, J. L., Dolhert, N., Friedman, L., Mumenthaler, M., & Yesavage, J. A. (1996). Alcohol elimination and simulator performance of male and female aviators: a preliminary report. *Aviation, Space, and Environmental Medicine, 67*(5), 407-413.

Taylor, J. L., Dolhert, N., Morrow, D., Friedman, L., et al. (1994). Acute and 8-hour effects of alcohol (0.08% BAC) on younger and older pilots' simulator performance. *Aviation, Space, and Environmental Medicine, 65*(8), 718-725.

Thapar, P., Zacny, J. P., Thompson, W., & Apfelbaum, J. L. (1995). Using alcohol as a standard to assess the degree of impairment induced by sedative and analgesic drugs used in ambulatory surgery. *Anesthesiology, 82*(1), 53-59.

Tinklenberg, J. R., Roth, W. T., & Kopell, B. S. (1976). Marijuana and ethanol: differential effects on time perception, heart rate, and subjective response. *Psychopharmacology, 49*(3), 275-279.

Tiplady, B., Degia, A., & Dixon, P. (2005). Assessment of driver impairment: Evaluation of a two-choice tester using ethanol. *Transportation Research Part F: Traffic Psychology and Behaviour, 8*(4-5), 299-310.

Tiplady, B., Drummond, G. B., Cameron, E., Gray, E., Hendry, J., Sinclair, W., et al. (2001). Ethanol, errors, and the speed-accuracy trade-off. *Pharmacology, Biochemistry and Behavior, 69*(3-4), 635-641.

Tiplady, B., Faineteau, H., Loganathan, A., Spiegelberg, M., Taylor, Z., & Wright, P. (1998). Effects of ethanol and temazepam on performance in memory and psychomotor tasks: a dose-response comparison. *Human Psychopharmacology: Clinical and Experimental, 13*(4), 285-291.

Tiplady, B., Franklin, N., & Scholey, A. (2004). Effect of ethanol on judgments of performance. *British Journal of Psychology, 95*(1), 105-118.

Tiplady, B., Harding, C., McLean, D., Ortner, C., Porter, K., & Wright, P. (1999). Effects of ethanol and temazepam on episodic and semantic memory: A dose-response comparison. *Human Psychopharmacology: Clinical and Experimental, 14*(4), 263-269.

Tiplady, B., Hiroz, J., Holmes, L., & Drummond, G. (2003). Errors in performance testing: A comparison of ethanol and temazepam. *Journal of Psychopharmacology, 17*(1), 41-49.

Tong, J. E., Henderson, P. R., & Chipperfield, B. G. (1980). Effects of ethanol and tobacco on auditory vigilance performance. *Addictive Behaviors, 5*(2), 153-158.

Tornros, J., & Laurell, H. (1991). Acute and hang-over effects of alcohol on simulated driving performance. *Blutalkohol, 28*(1), 24-30.

Tracy, J. I., & Bates, M. E. (1999). The selective effects of alcohol on automatic and effortful memory processes. *Neuropsychology, 13*(2), 282-290.

Tyson, P. D., & Schirmuly, M. (1994). Memory enhancement after drinking ethanol: Consolidation, interference, or response bias? *Physiology and Behavior, 56*(5), 933-937.

Tzambazis, K., & Stough, C. (2000). Alcohol impairs speed of information processing and simple and choice reaction time and differentially impairs higher-order cognitive abilities. *Alcohol and Alcoholism, 35*(2), 197-201.

van Harten, J., Stevens, L., Raghoebar, M., Holland, R., Wesnes, K., & Cournot, A. (1992). Fluvoxamine does not interact with alcohol or potentiate alcohol-related impairment of cognitive function. *Clinical Pharmacology and Therapeutics, 52*, 427-435.

Vermeeren, A., & O'Hanlon, J. F. (1998). Fexofenadine's effects, alone and with alcohol, on actual driving and psychomotor performance. *Journal of Allergy and Clinical Immunology, 101*(3), 306-311.

Vermeeren, A., Ramaekers, J. G., & O'Hanlon, J. F. (2002). Effects of emedastine and cetirizine, alone and with alcohol, on actual driving of males and females. *Journal of Psychopharmacology, 16*(1), 57-64.

Vermeeren, A., Riedel, W. J., van Boxtel, M. P. J., Darwish, M., Paty, I., & Patat, A. (2002). Differential residual effects of zaleplon and zopiclone on actual driving: A comparison with a low dose of alcohol. *Sleep: Journal of Sleep and Sleep Disorders Research, 25*(2), 224-231.

Vogel Sprott, M. (1976). Coding and vigilance under alcohol. *Journal of Studies on Alcohol, 37*(11), 1581-1592.

Vogel Sprott, M. D. (1979). Acute recovery and tolerance to low doses of alcohol: differences in cognitive and motor skill performance. *Psychopharmacology, 61*(3), 287-291.

von Wright, J. M., & Mikkonen, V. (1970). The influence of alcohol on the detection of light signals in different parts of the visual field. *Scandinavian Journal of Psychology, 11*(3), 167-175.

Vuchinich, R. E., & Sobell, M. B. (1978). Empirical separation of physiologic and expected effects of alcohol on complex perceptual motor performance. *Psychopharmacology, 60*(1), 81-85.

Vuurman, E. F. P. M., Muntjewerff, N. D., Uiterwijk, M. M. C., van Veggel, L. M. A., Crevoisier, C., Haglund, L., et al. (1996). Effects of mefloquine alone and with alcohol on psychomotor and driving performance. *European Journal of Clinical Pharmacology, 50*(6), 475-482.

Walker, D. J., & Zacny, J. P. (2001). Lack of effects of ethanol pretreatment on the abuse liability of nitrous oxide in light and moderate drinkers. *Addiction, 96*(12), 1839-1845.

Walsh, J. K., Humm, T., Muehlbach, M. J., Sugerman, J. L., et al. (1991). Sedative effects of ethanol at night. *Journal of Studies on Alcohol, 52*(6), 597-600.

Wang, M. Q., Taylor Nicholson, M. E., Airhihenbuwa, C. O., Mahoney, B. S., et al. (1992). Psychomotor and visual performance under the time-course effect of alcohol. *Perceptual and Motor Skills, 75*(3, Pt 2), 1095-1106.

Watten, R. G., & Lie, I. (1996). Visual functions and acute ingestion of alcohol. *Ophthalmic and Physiological Optics, 16*(6), 460-466.

Watten, R. G., & Lie, I. (1997). The effects of alcohol on eye movements during reading. *Alcohol and Alcoholism, 32*(3), 275-280.

Wegner, A.-J., & Fahle, M. (1999). Alcohol and visual performance. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 23*(3), 465-482.

Weiler, J. M., Bloomfield, J. R., Woodworth, G. G., Grant, A. R., Layton, T. A., Brown, T. L., et al. (2000). Effects of fexofenadine, diphenhydramine, and alcohol on driving performance: A randomized, placebo-controlled trial in the Iowa Driving Simulator. *Annals of Internal Medicine, 132*(5), 354-363.

Weintraub, A. L., & Goldman, M. S. (1983). Alcohol and proactive interference: A test of response eccentricity theory of alcohol's psychological effects. *Addictive Behaviors, 8*(2), 151-166.

Weissenborn, R., & Duka, T. (2000). State dependent effects of alcohol on explicit memory: The role of semantic associations. *Psychopharmacology, 149*(1), 98-106.

Weissenborn, R., & Duka, T. (2003). Acute alcohol effects on cognitive function in social drinkers: Their relationship to drinking habits. *Psychopharmacology, 165*(3), 306-312.

Wesnes, K. A., Garratt, C., Wickens, M., Gudgeon, A., & Oliver, S. (2000). Effects of sibutramine alone and with alcohol on cognitive function in healthy volunteers. *British Journal of Clinical Pharmacology, 49*(2), 110-117.

West, R. J., Wilding, J. M., French, D. J., Kemp, R., & al., e. (1993). Effect of low and moderate doses of alcohol on driving hazard perception latency and driving speed. *Addiction, 88*(4), 527-532.

Wick, R. L. (1992). Alcohol and pilot performance decrements. *Alcohol, Drugs and Driving, 8*(3-4), 207-215.

Wickelgren, W. A. (1975). Alcoholic intoxication and memory storage dynamics. *Memory and Cognition, 3*(4), 385-389.

Wilkie, H., & Stewart, S. H. (2005). Reinforcing Mood Effects of Alcohol in Coping and Enhancement Motivated Drinkers. *Alcoholism: Clinical & Experimental Research, 29*(5), 829-836.

Wilkinson, C. J. (1995). The acute effects of zolpidem, administered alone and with alcohol, on cognitive and psychomotor function. *Journal of Clinical Psychiatry, 56*(7), 309-318.

Wilson, W. H., Petrie, W. M., Ban, T. A., & Barry, D. E. (1981). The effects of amoxapine and ethanol on psychomotor skills related to driving: a placebo and standard controlled study. *Progress in Neuro-Psychopharmacology and Biological Psychiatry, 5*(3), 263-270.

Wright, A., & Terry, P. (2002). Modulation of the effects of alcohol on driving-related psychomotor skills by chronic exposure to cannabis. *Psychopharmacology, 160*(2), 213-219.

Yesavage, J. A., Dolhert, N., & Taylor, J. L. (1994). Flight simulator performance of younger and older aircraft pilots: Effects of age and alcohol. *Journal of the American Geriatrics Society, 42*(6), 577-582.

Zack, M. (1999). Reinforcement of a behavioral standard modifies individual differences under alcohol. *Journal of Studies on Alcohol, 60*(5), 675-684.

Zack, M., & Vogel Sprott, M. (1997). Drunk or sober? Learned conformity to a behavioral standard. *J Stud Alcohol, 58*(5), 495-501.

Zacny, J. P., & Yajnik, S. (1993). Effects of calcium channel inhibitors on ethanol effects and pharmacokinetics in healthy volunteers. *Alcohol, 10*(6), 505-509.

Zeichner, A., Allen, J. D., Giancola, P. R., & Lating, J. M. (1994). Alcohol and aggression: Effects of personal threat on human aggression and affective arousal. *Alcoholism: Clinical and Experimental Research, 18*(3), 657-663.

Zeichner, A., Allen, J. D., Petrie, C. D., Rasmussen, P. R., et al. (1993). Attention allocation: Effects of alcohol and information salience on attentional processes in male social drinkers. *Alcoholism: Clinical and Experimental Research, 17*(4), 727-732.

Zunder, P. M. (1977). Effects of alcohol and prediction outcome on extrafoveal signal detection. *J Stud Alcohol, 38*(3), 392-402.

8.6 References: Studies not accepted for the meta-analysis (excluded/not available)

Aarons, G. A. (1997). Does activation of alcohol expectancies mediate drinking? *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(7-B), 4691.

Abbey, A., Saenz, C., & Buck, P. O. (2005). The cumulative effects of acute alcohol consumption, individual differences and situational perceptions on sexual decision making. *Journal of Studies on Alcohol, 66*(1), 82-90.

Abramov, U., Raud, S., Innos, J., Koks, S., Matsui, T., & Vasar, E. (2006). Gender specific effects of ethanol in mice, lacking CCK2 receptors. *Behavioural Brain Research, 175*(1), 149-156.

Abrams, D. B., & Wilson, G. T. (1979). Effects of alcohol on social anxiety in women: cognitive versus physiological processes. *Journal of Abnormal Psychology, 88*(2), 161-173.

Adams, A. J., & Brown, B. (1975). Alcohol prolongs time course of glare recovery. *Nature, 257*(5526), 481-483.

Adams, A. J., Brown, B., Flom, M. C., Jones, R. T., & Jampolsky, A. (1975). Alcohol and marijuana effects on static visual acuity. *American Journal of Optometry and Physiological Optics, 52*(11), 729-735.

Adesso, V. J., Ritchie, S. A., & Stasiewicz, P. R. (1990). The acute effects of alcohol on the blood pressure of young, normotensive men. *Journal of Studies on Alcohol, 51*(5), 468-471.

Ahmad, S., Rohrbaugh, J. W., Anokhin, A. P., Sirevaag, E. J., & Goebel, J. A. (2002). Effects of lifetime ethanol consumption on postural control: A computerized dynamic posturography study. *Journal of Vestibular Research: Equilibrium and Orientation, 12*(1), 53-64.

Ahveninen, J., Escera, C., Polo, M., Grau, C., & Jaaskelainen, I. P. (2000). Acute and chronic effects of alcohol on preattentive auditory processing as reflected by mismatch negativity. *Audiology and Neuro Otology, 5*(6), 303-311.

Akine, Y., Kato, M., Muramatsu, T., Umeda, S., Mimura, M., Asai, Y., et al. (2007). Altered brain activation by a false recognition task in young abstinent patients with alcohol dependence. *Alcoholism: Clinical and Experimental Research, 31*(9), 1589-1597.

Aleman, A., Muller, M., de Haan, E. H., & van der Schouw, Y. T. (2005). Vascular risk factors and cognitive function in a sample of independently living men. *Neurobiology of Aging, 26*(4), 485-490.

Allen, H. M., Jr., & Bunn, W. B. (2003). Validating self-reported measures of productivity at work: a case for their credibility in a heavy manufacturing setting. *Journal of Occupational and Environmental Medicine, 45*(9), 926-940.

Ames, S. L. (2003). Implicit cognition and dissociative experiences as predictors of adolescent substance use. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 63*(9-B), 4413.

Anderson, M. M. (2000). Self-reliant resolution among problem drinkers. (field dependence). *Dissertation Abstracts International Section A: Humanities and Social Sciences, 60*(7-a), 2675.

Andre, J. T. (1996). Visual functioning in challenging conditions: Measuring and predicting the effects of alcohol consumption, stimulus motion, luminance, and glare on contrast sensitivity. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56*(9-B), 5200.

Arnedt, J. T., Owens, J., Crouch, M., Stahl, J., & Carskadon, M. A. (2005). Neurobehavioral performance of residents after heavy night call vs after alcohol ingestion. *Journal of the American Medical Association, 294*(9), 1025-1033.

Assefi, S. L., & Garry, M. (2003). Absolut® memory distortions: Alcohol placebos influence the misinformation effect. *Psychological Science, 14*(1), 77-80.

Autti Ramo, I., & Granstrom, M. L. (1991). The psychomotor development during the first year of life of infants exposed to intrauterine alcohol of various duration. Fetal alcohol exposure and development. *Neuropediatrics, 22*(2), 59-64.

Aviles, F., Earleywine, M., Pollock, V., Stratton, J., & Miller, N. (2005). Alcohol's effect on triggered displaced aggression. *psychology of addictive behaviors, 19*(1), 108-111.

Babor, T. F., Berglas, S., Mendelson, J. H., Ellingboe, J., & Miller, K. (1983). Alcohol, affect, and the disinhibition of verbal behavior. *Psychopharmacology, 80*(1), 53-60.

Backstrand, J. R., Allen, L. H., Martinez, E., & Pelto, G. H. (2001). Maternal consumption of pulque, a traditional central Mexican alcoholic beverage: relationships to infant growth and development. *Public Health Nutrition, 4*(4), 883-891.

Badosek, R. (2005). Spolehlivost psychomotorickeho vykonu pri interferenci / Psychomotor performance reliability during interference. *Ceskoslovenska Psychologie, 49*(1), 53-64.

Balbus Kornfeld, J. M., Stewart, W., Bolla, K. I., & Schwartz, B. S. (1995). Cumulative exposure to inorganic lead and neurobehavioural test performance in adults: an epidemiological review. *Occupational and Environmental Medicine, 52*(1), 2-12.

Barker, C. T. (2004). The alcohol hangover and its potential impact on the UK armed forces: a review of the literature on post-alcohol impairment. *Journal of the Royal Army Medical Corps, 150*(3), 168-174.

Barkley, R. A., Murphy, K. R., Dupaul, G. I., & Bush, T. (2002). Driving in young adults with attention deficit hyperactivity disorder: knowledge, performance, adverse outcomes, and the role of executive functioning. *Journal of the International Neuropsychological Society, 8*(5), 655-672.

Bates, J. E. (2002). An examination of hangover effects on pilot performance. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 62*(9-B), 4257.

Bates, M. E. (1997). Stability of neuropsychological assessments early in alcoholism treatment. *Journal of Studies on Alcohol, 58*(6), 617-621.

Bates, M. E., Voelbel, G. T., Buckman, J. F., Labouvie, E. W., & Barry, D. (2005). Short-term neuropsychological recovery in clients with substance use disorders. *Alcoholism: Clinical and Experimental Research, 29*(3), 367-377.

Beaunieux, H., Desgranges, B., Lalevee, C., de la Sayette, V., Lechevalier, B., & Eustache, F. (1998). Preservation of cognitive procedural memory in a case of Korsakoff's syndrome: methodological and theoretical insights. *Perceptual and Motor Skills, 86*(3 Pt 2), 1267-1287.

Bennett, R. M., Buss, A. H., & Carpenter, J. A. (1969). Alcohol and human physical aggression. *Quarterly Journal of Experimental Psychology, 30*(4), 870-876.

Bensafi, M., Frasnelli, J., Reden, J., & Hummel, T. (2007). The neural representation of odor is modulated by the presence of a trigeminal stimulus during odor encoding. *Clinical Neurophysiology, 118*(3), 669-701.

Berta, J. E. (1995). Factors influencing the alcohol withdrawal syndrome in mice. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56*(2-B), 1132.

Bijl, S., de Bruin, E. A., Bocker, K. B., Kenemans, J. L., & Verbaten, M. N. (2005). Chronic effects of social drinking in a card-sorting task: an event related potential study. *Clinical Neurophysiology, 116*(2), 376-385.

Bijl, S., de Bruin, E. A., Kenemans, J. L., Verbaten, M. N., & Bocker, K. B. (2005). Effects of chronic alcohol consumption in a visual attention task and an auditory oddball task: an event-related potential study. *Alcoholism: Clinical and Experimental Research, 29*(11), 2029-2038.

Bisaga, A., & Evans, S. M. (2006). The acute effects of gabapentin in combination with alcohol in heavy drinkers. *Drug and Alcohol Dependence, 83*(1), 25-32.

Blekher, T., O'Connor, S., Ramchandani, V., Li, T. K., & Yee, R. D. (1999). Influences of low concentrations of alcohol on saccadic eye movements. *Investigative Ophthamology and Visual Science, 40*, 60.

Blekher, T., Ramchandani, V. A., Flury, L., Foroud, T., Kareken, D., Yee, R. D., et al. (2002). Saccadic eye movements are associated with a family history of alcoholism at baseline and after exposure to alcohol. *Alcoholism: Clinical and Experimental Research, 26*(10), 1568-1573.

Bliss, S. K. (1998). Relationships among anxiety, depression, religiosity, and gender as clinically relevant predictors of alcohol and marijuana use in college students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(9-B), 5186.

Blum, T. C., Roman, P. M., & Martin, J. K. (1993). Alcohol consumption and work performance. *Journal of Studies on Alcohol, 54*(1), 61-70.

Bond, A. J., & Silveira, J. C. (1993). The combination of alprazolam and alcohol on behavioral aggression. *Journal of Studies on Alcohol, S11*, 30-39.

Bonomo, Y., Coffey, C., Wolfe, R., Lynskey, M., Bowes, G., & Patton, G. (2001). Adverse outcomes of alcohol use in adolescents. *Addiction, 96*(10), 1485-1496.

Booker, E. A., Haig, A. J., Geisser, M. E., & Yamakawa, K. (2003). Alcohol use self report in chronic back pain--relationships to psychosocial factors, function performance, and medication use. *Disability and Rehabilitation, 25*(22), 1271-1277.

Boyce Rustay, J. M., Wiedholz, L. M., Millstein, R. A., Carroll, J., Murphy, D. L., Daws, L. C., et al. (2006). Ethanol-related behaviors in serotonin transporter knockout mice. *Alcoholism: Clinical and Experimental Research, 30*(12), 1957-1965.

Boyle, J. A., Heinke, M., Gerber, J., Frasnelli, J., & Hummel, T. (2007). Cerebral activation to intranasal chemosensory trigeminal stimulation. *Chemical Senses, 32*(4), 343-353.

Bragg, B. W., & Wilson, W. (1980). Evaluation of a performance test to detect impaired drivers. *Accident Analysis and Prevention, 12*(1), 55-65.

Bramness, J. G., Skurtveit, S., & Morland, J. (2002). Clinical impairment of benzodiazepines--relation between benzodiazepine concentrations and impairment in apprehended drivers. *Drug and Alcohol Dependence, 68*(2), 131-141.

Brand, M., Fujiwara, E., Kalbe, E., Steingass, H. P., Kessler, J., & Markowitsch, H. J. (2003). Cognitive estimation and affective judgments in alcoholic Korsakoff patients. *Journal of Clinical and Experimental Neuropsychology, 25*(3), 324-334.

Brand, M., Kalbe, E., Fujiwara, E., Huber, M., & Markowitsch, H. J. (2003). Cognitive estimation in patients with probable Alzheimer's disease and alcoholic Korsakoff patients. *Neuropsychologia, 41*(5), 575-584.

Braunschweig, H. M. (2004). The aging of the "baby boom" generation: The potential for increased alcohol use and the need for concern. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64*(12-B), 6361.

Briddell, D. W., Rimm, D. C., Caddy, G. R., Krawitz, G., Sholis, D., & Wunderlin, R. J. (1978). Effects of alcohol and cognitive set on sexual arousal to deviant stimuli. *Journal of Abnormal Psychology, 87*(4), 418-430.

Briihl, D. S. (1995). The effects of alcohol upon the orienting of attention. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56*(4-B), 2358.

Brookhuis, K. A., de Waard, D., & Mulder, B. (1994). Measuring driving performance by car-following in traffic. *Ergonomics, 37*(3), 427-434.

Brookhuis, K. A., de Waard, D., & Samyn, N. (2004). Effects of MDMA (ecstasy), and multiple drugs use on (simulated) driving performance and traffic safety. *Psychopharmacology, 173*(3-4), 440-445.

Brown, D. L. (1997). Alcohol use in a college population. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(6-B), 3366.

Bruce, K. R. (1999). Effects of alcohol on emotionally salient memory. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60*(6-B), 2934.

Bruce, K. R., & Pihl, R. O. (1997). *Forget "drinking to forget": enhanced consolidation of emotionally charged memory by alcohol.* Paper presented at the Exp Clin Psychopharmacol.

Bruce, K. R., Pihl, R. O., Mayerovitch, J. I., & Shestowsky, J. S. (1999). Alcohol and retrograde memory effects: Role of individual differences. *Journal of Studies on Alcohol, 60*(1), 130-136.

Bruce, K. R., Shestowsky, J. S., Mayerovitch, J. I., & Pihl, R. O. (1999). Motivational effects of alcohol on memory consolidation and heart rate in social drinkers. *Alcoholism: Clinical and Experimental Research, 23*(4), 693-701.

Brunelle, C., Assaad, J. M., Barrett, S. P., Avila, C., Conrod, P. J., Tremblay, R. E., et al. (2004). Heightened heart ate response to alcohol intoxication is associated with a reward-seeking personality profile. *Alcoholism: Clinical and Experimental Research, 28*(3), 394-401.

Buczek, Y. (1998). The effect of chronic environmental and pharmacological stress on ethanol consumption in male Wistar rats. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(6-B), 2699.

Burden, M. J., Jacobson, S. W., Sokol, R. J., & Jacobson, J. L. (2005). Effects of prenatal alcohol exposure on attention and working memory at 7.5 years of age. *Alcoholism: Clinical and Experimental Research, 29*(3), 443-452.

Burns, M., & Moskowitz, H. (1981). Alcohol, marihuana and skills performance. In L. Goldberg (Ed.), *Alkohol, drugs and traffic safety* (pp. 954-968). Stockholm: Almquist and Wiksell.

Buser, A., Lachenmayr, B., Priemer, F., Langnau, A., & Gilg, T. (1996). Effect of low alcohol concentrations on visual attention in street traffic. *Der Ophthalmologe, 93*, 371-376.

Butryn, M. F., & Zeichner, A. (1997). Temperament, hostility, and consequences of alcohol use. *Psychological Reports, 80*(2), 544-546.

Calhoun, V. D., Pekar, J. J., & Pearlson, G. D. (2004). Alcohol intoxication effects on simulated driving: Exploring alcohol-dose effects on brain activation using functional MRI. *Neuropsychopharmacology, 29*(11), 2097-2107.

Campbell, G. D. (1996). Breath testing for alcohol. *South African Medical Journal, 86*(3), 278-279.

Carey, K. B. (1995). Effects of alcohol intoxication on self-focused attention. *Journal of Studies on Alcohol, 56*(2), 248-252.

Carter, J. A. (1998). Does cognitive inhibition efficiency moderate the relationships between alcohol expectancies and drinking behaviors? *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(6-B), 3051.

Cassisi, J. E., Delehant, M., Tsoutsouris, J. S., & Levin, J. (1998). Psychophysiological reactivity to alcohol advertising in light and moderate social drinkers. *Addictive Behaviors, 23*(2), 267-274.

Caudill, B. D. (1988). Alcohol and self-disclosure: The effect of expectancies and pharmacological impact of alcohol on the interpersonal behavior of male and female social drinkers. *Dissertation Abstracts International, 48*(9-B), 2819.

Caudill, B. D., & Kong, F. H. (2001). Social approval and facilitation in predicting modeling effects in alcohol consumption. *Journal of Substance Abuse, 13*(4), 425-441.

Cawthon, P. M., Fink, H. A., Barrett Connor, E., Cauley, J. A., Dam, T. T., Lewis, C. E., et al. (2007). Alcohol use, physical performance, and functional limitations in older men. *Journal of the American Geriatrics Society, 55*(2), 212-220.

Cellucci, T., Carter, S., & Evans, W. (2000). Does social drinking affect memory in older adults? *Journal of Clinical Geropsychology, 6*(2), 133-138.

Cermak, L. S., Hill, R., & Wong, B. (1998). Effects of spacing and repetition on amnesic patients' performance during perceptual identification, stem completion, and category exemplar production. *Neuropsychology, 12*(1), 65-77.

Cermak, L. S., & Wong, B. M. (1999). The effects of divided attention during encoding and retrieval on amnesic patients' memory performance. *Cortex, 35*(1), 73-87.

Chait, L. D., & Perry, J. L. (1994). Effects of alcohol pretreatment on human marijuana self-administration. *Psychopharmacology, 113*(3-4), 346-350.

Chapman, R. P. (2002). Parenting characteristics in predicting adolescent smoking and drinking expectancies and intentions. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 62*(12-B), 5986.

Chasseigne, G., Lafon, P., & Mullet, E. (2002). Aging and rule learning: The case of the multiplicative law. *American Journal of Psychology, 115*(3), 315-330.

Cheong, J., Patock Peckham, J. A., & Nagoshi, C. T. (2001). Effects of alcoholic beverage, instigation, and inhibition on expectancies of aggressive behavior. *Violence and Victims, 16*(2), 173-184.

Cherek, D. R., Steinberg, J. L., & Manno, B. R. (1985). Effects of alcohol on human aggressive behavior. *Journal of Studies on Alcohol, 46*(4), 321-328.

Cherek, D. R., Steinberg, J. L., & Vines, R. V. (1984). Low doses of alcohol affect human aggressive responses. *Biological Psychiatry, 19*(2), 263-267.

Chermack, S. T., & Giancola, P. R. (1997). The relation between alcohol and aggression: An integrated biopsychosocial conceptualization. *Clinical Psychology Review, 17*(6), 621-649.

Cho, A. M., Coalson, D. W., Klock, P. A., Klafta, J. M., Marks, S., Toledano, A. Y., et al. (1997). The effects of alcohol history on the reinforcing, subjective and psychomotor effects of nitrous oxide in healthy volunteers. *Drug and Alcohol Dependence, 45*(1-2), 63-70.

Ciesielski, K. T., Waldorf, A. V., & Jung, R. E., Jr. (1995). Anterior brain deficits in chronic alcoholism. Cause or effect? *Journal of Nervous and Mental Disease, 183*(12), 756-761.

Clarke, D. D., Ward, P., & Truman, W. (2005). Voluntary risk taking and skill deficits in young driver accidents in the UK. *Accident, analysis and prevention, 37*(3), 523-529.

Cohen, H. L., Porjesz, B., Begleiter, H., & Wang, W. (1997). Neurophysiological correlates of response production and inhibition in alcoholics. *Alcoholism: Clinical and Experimental Research, 21*(8), 1398-1406.

Colder, C. R., & O'Connor, R. (2002). Attention biases and disinhibited behavior as predictors of alcohol use and enhancement reasons for drinking. *Psychology of Addictive Behaviors, 16*(4), 325-332.

Coles, C. D. (2001). Fetal alcohol exposure and attention: moving beyond ADHD. *Alcohol Research and Health, 25*(3), 199-203.

Collins, W. E., Schroeder, D. J., & Hill, R. J. (1973). Some effects of alcohol on vestibular responses. *Advances in oto-rhino-laryngology, 19*, 295-303.

Colrain, I. M., Taylor, J., McLean, S., Buttery, R., et al. (1993). Dose dependent effects of alcohol on visual evoked potentials. *Psychopharmacology, 112*(2-3), 383-388.

Connor, P. D., Sampson, P. D., Streissguth, A. P., Bookstein, F. L., & Barr, H. M. (2006). Effects of prenatal alcohol exposure on fine motor coordination and balance: A study of two adult samples. *Neuropsychologia, 44*(5), 744-751.

Conrod, P., Peterson, J., & Pihl, R. (2001). Reliability and validity of alcohol-induced heart rate increase as a measure of sensitivity to the stimulant properties of alcohol. *Psychopharmacology, 157*(1), 20-30.

Conrod, P. J., Peterson, J. B., Pihl, R. O., & Mankowski, S. (1997). Biphasic effects of alcohol on heart rate are influenced by alcoholic family history and rate of alcohol ingestion. *Alcoholism: Clinical and Experimental Research, 21*(1), 140-149.

Cox, D. J., Quillian, W. C., Gressard, C. F., Westerman, P. S., et al. (1995). The effects of blood alcohol levels on driving variables in a high-risk population: Objective and subjective measures. *Journal of Alcohol and Drug Education, 40*(3), 84-98.

Cox, W., Blount, J. P., & Rozak, A. M. (2000). Alcohol abusers' and nonabusers' distraction by alcohol and concern-related stimuli. *American Journal of Drug and Alcohol Abuse, 26*(3), 489-495.

Cox, W., Brown, M. A., & Rowlands, L. J. (2003). The effects of alcohol cue exposure on non-dependent drinkers' attentional bias for alcohol-related stimuli. *Alcohol and Alcoholism, 38*(1), 45-49.

Csabi, G., & Tenyi, T. (2006). Magatartasi fenotipusok es kognitiv sajatsagok mentalis retardacioban. [Behavioral phenotypes and cognitive characteristics in mental retardation]. *Neuropsychopharmacologia Hungarica, 8*(3), 127-142.

Cumming, S., Harris, L., Kiernan, M., & Williams, R. (2001). Semantic priming of expectancies among high- and low-restraint non-problem drinkers. *Australian Journal of Psychology, 53*(3), 155-159.

Czachowski, C. L. (1999). Ethanol-seeking and self-administration in a runway paradigm. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(7-B), 3676.

Damkot, D. K., & Frysinger, R. C. (1978). Alcohol influence on hemisphere differences and signal detection thresholds. *Psychopharmacology, 56*(2), 173-177.

Darbra, S., Prat, G., Pallares, M., & Ferre, N. (2002). Tolerance and sensitization to the hypnotic effects of alcohol induced by chronic voluntary alcohol intake in rats. *Journal of Psychopharmacolog, 16*(1), 79-83.

Davies, S. J., Pandit, S. A., Feeney, A., Stevenson, B. J., Kerwin, R. W., Nutt, D. J., et al. (2005). Is there cognitive impairment in clinically 'healthy' abstinent alcohol dependence? *Alcohol and Alcoholism, 40*(6), 498-503.

Dawson, D., & Reid, K. (1997). Fatigue, alcohol and performance impairment. *Nature, 388*(6639), 235.

de Boer, M. C., Schippers, G. M., & Van der Staak, C. P. (1993). Alcohol and social anxiety in women and men: Pharmacological and expectancy effects. *Addictive Behaviors, 18*(2), 117-126.

de Boer, M. C., Schippers, G. M., & van der Staak, C. P. F. (1994). The effects of alcohol, expectancy, and alcohol beliefs on anxiety and self-disclosure in women: Do beliefs moderate alcohol effects? *Addictive Behaviors, 19*(5), 509-520.

De Cesarei, A., Codispoti, M., Schupp, H. T., & Stegagno, L. (2006). Selectively attending to natural scenes after alcohol consumption: An ERP analysis. *Biological Psychology, 72*(1), 35-45.

De Croock, M. B. M., & Van Merrienboer, J. J. G. (2007). Paradoxical effects of information presentation formats and contextual interference on transfer of a complex cognitive skill. *Computers in Human Behavior, 23*(4), 1740-1761.

De Houwer, J., & De Bruycker, E. (2007). The identification-EAST as a valid measure of implicit attitudes toward alcohol-related stimuli. *Journal of Behavior Therapy and Experimental Psychiatry, 38*(2), 133-143.

de Wit, H., Dudish, S., & Ambre, J. (1993). Subjective and behavioral effects of diazepam depend on its rate of onset. *Psychopharmacology, 112*(2-3), 324-330.

de Wit, H., Uhlenhuth, E. H., Pierri, J., & Johanson, C. E. (1987). Individual differences in behavioral and subjective responses to alcohol. *Alcoholism: Clinical and Experimental Research, 11*(1), 52-59.

Deery, H. A., & Love, A. W. (1996). The Driving Expectancy Questionnaire: development, psychometric assessment and predictive utility among young drink-drivers. *Journal of Studies on Alcohol, 57*(2), 193-202.

Delis, D. C., Squire, L. R., Bihrle, A., & Massman, P. (1992). Componential analysis of problem-solving ability: performance of patients with frontal lobe damage and amnesic patients on a new sorting test. *Neuropsychologia, 30*(8), 683-697.

Dennis, M. E. (1993). Chronic alcohol abuse effects on driving task abilities. *Journal of Alcohol and Drug Education, 39*(1), 107-110.

Desapriya, E. B., Iwase, N., Brussoni, M., Shimizu, S., & Belayneh, T. N. (2003). International policies on alcohol impaired driving: are legal blood alcohol concentration (BAC) limits in motorized countries compatible with the scientific evidence? *Nihon Arukoru Yakubutsu Igakkai Zasshi (Japanese Journal of Alcohol Studies and Drug Dependence), 38*(2), 83-102.

Dewey, J. D. (1998). Assessing predictors and effects of college student drinking behavior for the purpose of identifying problem drinkers. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(2-B), 0911.

DeWit, H., Pierri, J., & Johanson, C. E. (1989). Assessing individual differences in ethanol preference using a cumulative dosing procedure. *Psychopharmacology, 98*(1), 113-119.

Dickinson, A., Wood, N., & Smith, J. W. (2002). Alcohol seeking by rats: action or habit? *Quarterly Journal of Experimental Psychology B, 55*(4), 331-348.

Dinges, D. F., & Kribbs, N. B. (1990). Comparison of the effects of alcohol and sleepiness on simple reaction time performance: Enhanced habituation as a common process. *Alcohol, Drugs and Driving, 5 & 6*(4 & 1), 329-339.

Doebrick, C., & Todman, M. (2003). Schematic processing of cigarette smoking and drinking information: Separate or shared? *Addiction Research and Theory, 11*(5), 295-315.

Doebrick, C. A. (1996). Schematic processing of smoking and drinking information based on personal experience with cigarettes and alcohol. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56*(9-B), 5167.

Dolbec, J., Mergler, D., Sousa Passos, C. J., Sousa de Morais, S., & Lebel, J. (2000). Methylmercury exposure affects motor performance of a riverine population of the Tapajos river, Brazilian Amazon. *Journal of Behavior Therapy and Experimental Psychiatry, 73*(3), 195-203.

Dougherty, D. M., Bjork, J. M., & Bennett, R. H. (1998). Effects of alcohol on rotary pursuit performance: A gender comparison. *Psychological Record, 48*(3), 393-405.

Dufouil, C., & Alperovitch, A. (2000). Couple similarities for cognitive functions and psychological health. *Journal of Clinical Epidemiology, 53*(6), 589-593.

Dunn, M. E., & Earleywine, M. (2001). Activation of alcohol expectancies in memory in relation to limb of the blood alcohol curve. *Psychology of Addictive Behaviors, 15*(1), 18-24.

Dunn, M. E., Lau, H., & Cruz, I. Y. (2000). Changes in activation of alcohol expectancies in memory in relation to changes in alcohol use after participation in an expectancy challenge program. *Experimental and Clinical Psychopharmacology, 8*(4), 566-575.

Durvasula, R. S., Myers, H. F., Mason, K., & Hinkin, C. (2006). Relationship between alcohol use/abuse, HIV infection and neuropsychological performance in African American men. *Journal of Clinical and Experimental Neuropsychology, 28*(3), 383-404.

Earleywine, M. (1995). Measurement issues in the assessment of acute changes in responses to alcohol. *Experimental and Clinical Psychopharmacology, 3*(4), 382-388.

Earleywine, M., & Martin, C. S. (1993). Anticipated stimulant and sedative effects of alcohol vary with dosage and limb of the blood alcohol curve. *Alcoholism: Clinical and Experimental Research, 17*(1), 135-139.

Echeverria, D., Fine, L., Langolf, G., Schork, T., & Sampaio, C. (1991). Acute behavioural comparisons of toluene and ethanol in human subjects. *British Journal of Industrial Medicine, 48*, 750-761.

Eckardt, J., File, S. E., Gessa, G. L., Grant, K. A., Guerric, C., Hoffmann, P., et al. (1998). Effects of moderate alcohol consumption on the central nervous system. *Alcoholism: Clinical and Experimental Research, 22*(5), 248-259.

Eidle, W. (1966). *The effect of a mild alcohol dose on tactual vernier acuity, simple addition, and purdue pegboard performance.* Unpublished Doct. Diss., Fordham University.

Elwood, P. C., Gallacher, J. E. J., Hopkinson, C. A., Pickering, J., Rabbitt, P., Stollery, B., et al. (1999). Smoking, drinking, and other lifestyle factors and cognitive function in men in the Caerphilly cohort. *Journal of Epidemiology and Community Health, 53*(1), 9-14.

Eng, M. Y., Schuckit, M. A., & Smith, T. L. (2005). The level of response to alcohol in daughters of alcoholics and controls. *Drug and Alcohol Dependence, 79*(1), 83-93.

Engelgardt, P., & Sliwka, K. (2006). Metody wstepnej oceny sprawnosci psychofizycznej kierowcow. [Methods of preliminary evaluation of psychophysical skills of drivers]. *Archiv Medicine Sadowej Kryminol, 56*(1), 31-38.

Enggasser, J. L., & de Wit, H. (2001). Haloperidol reduces stimulant and reinforcing effects of ethanol in social drinkers. *Alcoholism: Clinical and Experimental Research, 25*(10), 1448-1456.

Ensrud, K. E., Nevitt, M. C., Yunis, C., Cauley, J. A., Seeley, D. G., Fox, K. M., et al. (1994). Correlates of impaired function in older women. *Journal of the American Geriatrics Society, 42*(5), 481-489.

Erblich, J. (1997). Risk-related differences in neurocognitive responses to an ethanol challenge. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(5-B), 2671.

Erblich, J., & Earleywine, M. (2003). Behavioral undercontrol and subjective stimulant and sedative effects of alcohol intoxication: Independent predictors of drinking habits? *Alcoholism: Clinical and Experimental Research, 27*(1), 44-50.

Evans, S. M., & Levin, F. R. (2002). The effects of alprazolam and buspirone in light and moderate female social drinkers. *Behavioural Pharmacology, 13*(5-6), 427-439.

Farrimond, T. (1990). Effect of alcohol on visual constancy values and possible relation to driving performance. *Perceptual and Motor Skills, 70*(1), 291-295.

Ferrara, S. D., Zancaner, S., & Giorgetti, R. (1994). Low blood alcohol concentrations and driving impairment. A review of experimental studies and international legislation. *International Journal of Legal Medicine, 106*(4), 169-177.

Ferreira, S. E., de Mello, M. T., Pompeia, S., & de Souza Formigoni, M. L. (2006). Effects of energy drink ingestion on alcohol intoxication. *Alcoholism: Clinical and Experimental Research, 30*(4), 598-605.

Ferreira, S. E., Mello, M. T., Rossi, M. V., & Souza-Formigoni, M. L. O. (2004). Does an energy drink modify the effects of alcohol in a maximal effort test? *Alcoholism: Clinical and Experimental Research, 28*(9), 1408-1412.

Field, M., & Eastwood, B. (2005). Experimental manipulation of attentional bias increases the motivation to drink alcohol. *Psychopharmacology, 183*(3), 350-357.

Fillmore, M. T., Mulvihill, L. E., & Vogel Sprott, M. (1994). The expected drug and its expected effect interact to determine placebo responses to alcohol and caffeine. *Psychopharmacology, 115*(3), 383-388.

Fillmore, M. T., & Vogel Sprott, M. (1994). Psychomotor performance under alcohol and under caffeine: Expectancy and pharmacological effects. *Experimental and Clinical Psychopharmacology, 2*(4), 319-327.

Fillmore, M. T., & Vogel Sprott, M. (1995). Behavioral effects of combining alcohol and caffeine: Contribution of drug-related expectancies. *Experimental and Clinical Psychopharmacology, 3*(1), 33-38.

Fillmore, M. T., & Vogel Sprott, M. (1996). Social drinking history, behavioral tolerance and the expectation of alcohol. *Psychopharmacology, 127*(4), 359-364.

Finn, P. R. (1999). Studies of the acute effects of alcohol on cognition and impulsive, disinhibited behavior. In A. Noronha, M. Eckardt, & K. Warrant (Eds.). Review of NIAAA's Neuroscience and Behavioral Research Portfolio, National Institute on Alcohol Abuse and Alcoholism Research Monograph No. 34, pp. 337-356.

Finn, P. R., Zeitouni, N. C., & Pihl, R. O. (1990). Effects of alcohol on psychophysiological hyperreactivity to nonaversive and aversive stimuli in men at high risk for alcoholism. *Journal of Abnormal Psychology, 99*(1), 79-85.

Finnigan, F., Hammersley, R., & Millar, K. (1998). Effects of meal composition on blood alcohol level, psychomotor performance and subjective state after ingestion of alcohol. *Appetite, 31*(3), 361-375.

Finnigan, F., Schulze, D., Smallwood, J., & Helander, A. (2005). The effects of self-administered alcohol-induced 'hangover' in a naturalistic setting on psychomotor and cognitive performance and subjective state. *Addiction, 100*(11), 1680-1689.

Fishbein, D. H., Jaffe, J. H., Snyder, F. R., Haertzen, C. A., et al. (1993). Drug users' self-reports of behaviors and affective states under the influence of alcohol. *International Journal of the Addictions, 28*(14), 1565-1585.

Fogt, N., Baughman, B. J., & Good, G. W. (2001). On determining the relationship between blood alcohol concentration and smooth pursuit eye movements. *Aviation, Space, and Environmental Medicine, 72*(6), 579-585.

Foltin, R. W., Fischman, M. W., Pippen, P. A., & Kelly, T. H. (1993). Behavioral effects of cocaine alone and in combination with ethanol or marijuana in humans. *Drug and Alcohol Dependence, 32*(2), 93-106.

Fooshee, S. G. (1998). A psychometric evaluation of an instrument designed to measure alcohol-induced blackouts. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(8-B), 4500.

Forrest, F., Florey, C. D., Taylor, D., McPherson, F., & Young, J. A. (1991). Reported social alcohol consumption during pregnancy and infants' development at 18 months. *BMJ, 303*(6793), 22-26.

Franks, C. M. (1964). The effects of alcohol upon fluctuation in perspective, blink rate and eye movements. *Quarterly Journal of Experimental Psychology, 25*, 56-67.

Franks, H. M., Starmer, G. A., Chesher, G. B., Jackson, D. M., Hensley, V. R., & Hensley, W. J. (1975). The interaction of alcohol and delta 9 tetrahydrocannabinol in man: Effects on psychomotor skills related to driving. In S. Israelstam & S. Lambert (Eds.), *Alcohol, drugs and traffic safety* (pp. 461-466). Toronto: Addiction Research Foundation.

Fraser, A. G. (1998). Is there an interaction between H2-antagonists and alcohol? *Drug Metabolism and Drug Interactions, 14*(3), 123-145.

Friedel, B., & Reker, K. (1995). Testfahrten im Daimler Benz Fahrsimulator unter Einfluss von Alprazolam und Alkohol. *Zeitschrift fuer Verkehrssicherheit, 41*(3), 98-109.

Fryer, S. L., Tapert, S. F., Mattson, S. N., Paulus, M. P., Spadoni, A. D., & Riley, E. P. (2007). Prenatal alcohol exposure affects frontal-striatal BOLD response during inhibitory control. *Alcoholism: Clinical and Experimental Research, 31*(8), 1415-1424.

Gabrielli, W. F., Jr., Nagoshi, C. T., Rhea, S. A., & Wilson, J. R. (1991). Anticipated and subjective sensitivities to alcohol. *Journal of Studies on Alcohol, 52*(3), 205-214.

Galanis, D. J., Joseph, C., Masaki, K. H., Petrovitch, H., Ross, G., & White, L. (2000). A longitudinal study of drinking and cognitive performance in elderly Japanese American men: The Honolulu-Asia Aging Study. *American Journal of Public Health, 90*(8), 1254-1259.

Galanis, D. J., Joseph, C., Masaki, K. H., Petrovitch, H., Ross, G. W., & White, L. (2000). A longitudinal study of drinking and cognitive performance in elderly Japanese American men: the Honolulu-Asia Aging Study. *American Journal of Public Health, 90*(8), 1254-1259.

Galen, L. W. (1997). Accessing alcohol expectancy networks through semantic priming. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(12-B), 7724.

Garrido, M. J., & Fernandez Guinea, S. (2004). Deficit neuropsicologicos en alcoholicos: implicaciones para la seguridad vial. *Revista de Neurologia, 38*(3), 277-283.

Gavrilova, S. I., Korsakova, N. K., Vavilov, S. B., Selezneva, N. D., Kalyn Ya, B., Dybovskaya, N. R., et al. (1991). Clinical heterogeneity of dementias of the Alzheimer's type. *Neuroscience and Behavioral Physiology, 21*(5), 469-476.

Geller, E. S., Clarke, S. W., & Kalsher, M. J. (1991). Knowing when to say when: a simple assessment of alcohol impairment. *Journal of Applied Behavior Analysis, 24*(1), 65-72.

George, W. H., Raynor, J. O., & Nochaiski, T. H. (1990). Resistance to alcohol impairment of visual motor performance: II. Effects for attentional Set and self reported concentration. *Pharmacology, Biochemistry and Behavior, 36*(2), 261-266.

Giancola, P. R. (2000). Executive functioning: A conceptual framework for alcohol-related aggression. *Experimental and Clinical Psychopharmacology, 8*(4), 576-597.

Giancola, P. R. (2002a). Alcohol-related aggression in men and women: The influence of dispositional aggressivity. *Journal of Studies on Alcohol, 63*(6), 696-708.

Giancola, P. R. (2002b). The influence of trait anger on the alcohol-aggression relation in men and women. *Alcoholism: Clinical and Experimental Research, 26*(9), 1350-1358.

Giancola, P. R. (2004). Executive functioning and alcohol-related aggression. *Journal of Abnormal Psychology, 113*(4), 541-555.

Giancola, P. R., & Corman, M. D. (2007). Alcohol and aggression: a test of the attention-allocation model. *Psychology Science, 18*(7), 649-655.

Giancola, P. R., Helton, E. L., Osborne, A. B., Terry, M. K., Fuss, A. M., & Westerfield, J. A. (2002). The effects of alcohol and provocation on aggressive behavior in men and women. *Journal of Studies on Alcohol, 63*(1), 64-73.

Giancola, P. R., Reagin, C. M., van Weenen, R. V., & Zeichner, A. (1998). Alcohol-induced stimulation and sedation: Relation to physical aggression. *Journal of General Psychology, 125*(4), 297-304.

Giancola, P. R., Saucier, D. A., & Gussler Burkhardt, N. L. (2003). The effects of affective, behavioral, and cognitive components of trait anger on the alcohol-aggression relation. *Alcoholism: Clinical and Experimental Research, 27*(12), 1944-1954.

Giancola, P. R., & Zeichner, A. (1995). Alcohol-related aggression in males and females: Effects of blood alcohol concentration, subjective intoxication, personality, and provocation. *Alcoholism: Clinical and Experimental Research, 19*(1), 130-134.

Giancola, P. R., Zeichner, A., Yarnell, J. E., & Dickson, K. E. (1996). Relation between executive cognitive functioning and the adverse consequences of alcohol use in social drinkers. *Alcoholism: Clinical and Experimental Research, 20*(6), 1094-1098.

Girre, C., Hirschhorn, M., Bertaux, L., Palombo, S., & Fournier, P. E. (1991). Comparison of performance of healthy volunteers given prazepam alone or combined with ethanol. Relation to drug plasma concentrations. *International Clinical Psychopharmacology, 6*(4), 227-238.

Goldman, M. S. (1999). Risk for substance abuse: Memory as a common etiological pathway. *Psychological Science, 10*(3), 196-198.

Gomberg, E. L. (1993). Alcohol, women and the expression of aggression. *Journal of Studies on Alcohol, S11*, 89-95.

Gooding, P. A., Mayes, A. R., & Meudell, P. (1994). Long lasting indirect memory performance for abstract shapes in amnesics and matched controls. *Neuropsychologia, 32*(9), 1135-1143.

Gooding, P. A., van Eijk, R., Mayes, A. R., & Meudell, P. (1993). Preserved pattern completion priming for novel, abstract geometric shapes in amnesics of several aetiologies. *Neuropsychologia, 31*(8), 789-810.

Gorske, T. T., Daley, D. C., Yenerall, E., & Morrow, L. A. (2006). Neuropsychological Function and Employment Status in a Welfare-to-Work Sample. *Applied Neuropsychology, 13*(3), 141-150.

Goyert, H. F., Frank, M. E., Gent, J. F., & Hettinger, T. P. (2007). Characteristic component odors emerge from mixtures after selective adaptation. *Brain Research Bulletin, 72*(1), 1-9.

Grattan Miscio, K. E. (2004). When immediate working memory fails to work: Effects of alcohol and performance incentives. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 65*(5-B), 2659.

Gregory, B. M. (2001). College alcohol and life skills study with student-athletes. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 62*(1-a), 89.

Gregory, J. M., Xie, X., & Mengel, S. A. (2004). SLEEP (Sleep Loss Effects On Everyday Performance) Model. *Aviation, Space, and Environmental Medicine, 75*(3 Suppl), A125-133.

Gritz, E. R., Carmack, C. L., de Moor, C., Coscarelli, A., Schacherer, C. W., Meyers, E. G., et al. (1999). First year after head and neck cancer: quality of life. *Journal of Clinical Oncology, 17*(1), 352-360.

Guimond, A., Braun, C. M., Rouleau, I., Belanger, F., & Godbout, L. (2006). Remembering the past and foreseeing the future while dealing with the present: a comparison of young adult and elderly cohorts on a multitask simulation of occupational activities. *Experimental Aging Research, 32*(3), 363-380.

Guinard, J. X., Zoumas Morse, C., Dietz, J., Goldberg, S., et al. (1996). Does consumption of beer, alcohol, and bitter substances affect bitterness perception? *Physiology and Behavior, 59*(4-5), 625-631.

Günther, B. H., V. (1976). Determinationsleistung und Drehsinnschwelle bei geringer Alkoholdosierung (um 0,5o/oo) unter Berücksichtigung habitueller und situativer Persönlichkeitsaspekte. *Pharmakopsychiatrie, Neuro-Psychopharmakologie, 9*, 323-331.

Gupta, A. M., Baraona, E., & Lieber, C. S. (1995). Significant increase of blood alcohol by cimetidine after repetitive drinking of small alcohol doses. *Alcoholism: Clinical and Experimental Research, 19*(4), 1083-1087.

Gustafson, R. (1984). Alcohol, frustration, and direct physical aggression: a methodological point of view. *Psychological Reports, 55*(3), 959-966.

Gustafson, R. (1985). Alcohol and aggression: a validation study of the Taylor aggression paradigm. *Psychological Reports, 57*(2), 667-676.

Gustafson, R. (1987). Alcohol and human physical aggression: An experiment using a "backward" balanced placebo design. *Journal of Social Behavior and Personality, 2*(1), 135-144.

Gustafson, R. (1988). Beer intoxication and physical aggression in males. *Drug and Alcohol Dependence, 21*(3), 237-242.

Gustafson, R. (1988). Effects of alcohol on power in social interaction between man and woman. *Journal of Studies on Alcohol, 49*(1), 78-84.

Gustafson, R. (1989). Alcohol and the validation of experimental aggression paradigms: the Taylor reaction time procedure. *Drug and Alcohol Dependence, 23*(1), 49-54.

Gustafson, R. (1990a). Alcohol-related expectancies reported by college women to a large dose of alcohol. *Psychological Reports, 67*(1), 99-106.

Gustafson, R. (1990b). Wine and male physical aggression. *Journal of Drug Issues, 20*(1), 75-86.

Gustafson, R. (1991). Effect of alcohol on quantity of creative production using Purdue Tests. *Psychological Report, 69*, 83-90.

Gustafson, R. (1993). What do experimental paradigms tell us about alcohol-related aggressive responding? *Journal of Studies on Alcohol Supplement, 11,* 20-29.

Gustafson, R. (1994). Alcohol and aggression. *Journal of Offender Rehabilitation, 21*(3-4), 41-80.

Gustafson, R., & Kallmen, H. (1990). Alcohol, subliminal stimulation, and disinhibitory processes. *Perceptual and Motor Skills, 70*(2), 495-502.

Gustafson, R., & Norlander, T. (1994). Effects of alcohol on persistent effort and deductive thinking during the preparation phase of the creative process. *Journal of Creative Behavior, 28*(2), 124-132.

Guthrie, S. K. (1991). Sertraline: a new specific serotonin reuptake blocker. *Drug Intelligence and Clinical Pharmacy, 25*(9), 952-961.

Hahn, H. A., & Price, D. L. (1994). Assessment of the relative effects of alcohol on different types of job behaviour. *Ergonomics, 37*(3), 435-448.

Hammersley, R., Finnigan, F., & Millar, K. (1993). The structure of the expected and actual subjective effects of alcohol. *Addiction Research, 1*(3), 207-222.

Hammersley, R., Finnigan, F., & Millar, K. (1994). Individual differences in the acute response to alcohol. *Personality and Individual Differences, 17*(4), 497-510.

Harder, T., & Reker, U. (1995). Influence of low dose alcohol on fixation suppression. *Acta Otolaryngol Suppl Acta oto-laryngologica. Supplementum, 520*(Pt 1), 33-36.

Harrell, T. H., Honaker, L., & Davis, E. (1991). Cognitive and behavioral dimensions of dysfunction in alcohol and polydrug abusers. *Journal of Substance Abuse, 3*(4), 415-426.

Harrison, E. L., & Fillmore, M. T. (2005). Transfer of learning to compensate for impairment by alcohol and visual degradation. *Psychopharmacology, 182*(4), 461-467.

Haubenreisser, T., & Vogel Sprott, M. (1983). Tolerance development in humans with task practice on different limbs of the blood-alcohol curve. *Psychopharmacology, 81*(4), 350-353.

Heath, A. C., & Martin, N. G. (1992). Genetic differences in psychomotor performance decrement after alcohol: a multivariate analysis. *Journal of Studies on Alcohol, 53*(3), 262-271.

Heifer, U. (1976). Elektronystagmographische Untersuchungen über Grad, Zeitdauer und verkehrsbezogene Gefährlichkeit geringer Alkoholdosen (0,3 - 0,5 - 0,8g/kg/h). *Blutalkohol, 13*, 66-75.

Herberg, K. W. (1993). Zum Einfluss von Kava-Spezialextrakt WS 1490 in Kombination mit Ethylalkohol auf sicherheitsrelevante Leistungsparameter. *Blutalkohol, 30*(2), 96-105.

Hermann, D., Sartorius, A., Welzel, H., Walter, S., Skopp, G., Ende, G., et al. (2007). Dorsolateral prefrontal cortex N-acetylaspartate/total creatine (NAA/tCr) loss in male recreational cannabis users. *Biological Psychiatry, 61*(11), 1281-1289.

Herzog, T. A. (1999). Effects of alcohol intoxication on social inferences. *Experimental and Clinical Psychopharmacology, 7*(4), 448-453.

Higgins, S. T., & Stitzer, M. L. (1988). Effects of alcohol on speaking in isolated humans. *Psychopharmacology (Berl), 95*(2), 189-194.

Hildebrandt, H., Brokate, B., Eling, P., & Lanz, M. (2004). Response shifting and inhibition, but not working memory, are impaired after long-term heavy alcohol consumption. *Neuropsychology, 18*(2), 203-211.

Hiltunen, A. J. (1997). Acute alcohol tolerance in social drinkers: Changes in subjective effects dependent on the alcohol dose and prior alcohol experience. *Alcohol, 14*(4), 373-378.

Hiltunen, A. J., Saxon, L., Skagerberg, S., & Borg, S. (2000). Acute tolerance during intravenous infusion of alcohol: Comparison of performance during ascending and steady state concentrations – A pilot study. *Alcohol, 22*(2), 69-74.

Himle, J. A., Abelson, J. L., Haghightgou, H., Hill, E. M., Nesse, R. M., & Curtis, G. C. (1999). Effect of alcohol on social phobic anxiety. *American Journal of Psychiatry, 156*(8), 1237-1243.

Hindmarch, I., Kerr, J. S., & Sherwood, N. (1991). The effects of alcohol and other drugs on psychomotor performance and cognitive function. *Alcohol and Alcoholism, 26*(1), 71-79.

Hoaken, P. N. S. (2003). Executive cognitive function, alcohol intoxication, and aggressive behaviour in adult men and women. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64*(1-B), 403.

Hoaken, P. N. S., Giancola, P. R., & Pihl, R. O. (1998). Executive cognitive functions as mediators of alcohol-related aggression. *Alcohol and Alcoholism, 33*(1), 47-54.

Hogan, R. E., & Gilmartin, B. (1985). The relationship between tonic vergence and oculomotor stress induced by ethanol. *Ophthalmic and Physiological Optics, 5*(1), 43-51.

Hogan, R. E., & Linfield, P. B. (1983). The effects of moderate doses of ethanol on heterophoria and other aspects of binocular vision. *Ophthalmic and Physiological Optics, 3*(1), 21-31.

Hogman, B., Bergman, H., Borg, S., Eriksson, T., Goldberg, L., Jones, A. W., et al. (1977). Readaptation time after photo stress. Alcohol-induced acute and post-alcohol 'hangover' changes in ocular readaptation time. *Psychopharmacology, 53*(2), 165-167.

Holdstock, J. S., Shaw, C., & Aggleton, J. P. (1995). The performance of amnesic subjects on tests of delayed matching-to-sample and delayed matching-to-position. *Neuropsychologia, 33*(12), 1583-1596.

Holdstock, L. (2000). Individual differences in the subjective, performance and cognitive effects of ethanol. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 61*(3-B), 1690.

Holdstock, L., & de Wit, H. (1999). Individual differences in subjective responses to ethanol and triazolam. *Behavioural Pharmacology, 10*(3), 283-295.

Holdstock, L., King, A. C., & de Wit, H. (2000). Subjective and objective responses to ethanol in moderate/heavy and light social drinkers. *Alcohol Clin Exp Res, 24*(6), 789-794.

Hollien, H., DeJong, G., & Martin, C. A. (1998). Production of intoxication states by actors: Perception of lay listeners. *Journal of Forensic Sciences, 43*(6), 1153-1162.

Holloway, F. A. (1994). Low-dose alcohol effects on human behavior and performance. *Alcohol, Drugs and Driving, 11*(1), 39-55.

Holroyd, C. B., & Yeung, N. (2003). Alcohol and error processing. *Trends in Neurosciences, 26*(8), 402-404.

Honkanen, R. (1993). Alcohol in home and leisure injuries. *Addiction, 88*(7), 939-944.

Houben, K., & Wiers, R. W. (2006). A test of the salience asymmetry interpretation of the alcohol-IAT. *Experimental Psychology, 53*(4), 292-300.

Howland, J., Rohsenow, D. J., Cote, J., Siegel, M., & Mangione, T. W. (2000). Effects of low-dose alcohol exposure on simulated merchant ship handling power plant operation by maritime cadets. *Addiction, 95*(5), 719-726.

Hughes, F. W., Forney, R. B., & Gates, P. W. (1963). Performance in human subjects under delayed auditory feedback after alcohol, a tranquilizer (benzquinamide) or benzquinamide-alcohol combination. *Journal of Psychology: Interdisciplinary and Applied, 55,* 25-32.

Iankova, A. (2006). The Glasgow Coma Scale: clinical application in emergency departments. *Emergency Nurse, 14*(8), 30-35.

Jääskeläinen, I. P., Lehtokoski, A., Kujala, T., Pekkonen, E., et al. (1995). Low dose of ethanol suppresses mismatch negativity of auditory event-related potentials. *Alcoholism: Clinical and Experimental Research, 19*(3), 607-610.

Jacobson, S. W., Chiodo, L. M., Sokol, R. J., & Jacobson, J. L. (2002). Validity of maternal report of prenatal alcohol, cocaine, and smoking in relation to neurobehavioral outcome. *Pediatrics, 109*(5), 815-825.

Jamerson, P. A., Wulser, M. J., & Kimler, B. F. (2004). Neurobehavioral effects in rat pups whose sires were exposed to alcohol. *Developmental Brain Research, 149*(2), 103-111.

Janzen, L. A., Nanson, J. L., & Block, G. W. (1995). Neuropsychological evaluation of preschoolers with fetal alcohol syndrome. *Neurotoxicology and Teratology, 17*(3), 273-279.

Jefferson, C. D., Drake, C. L., Scofield, H. M., Myers, E., McClure, T., Roehrs, T., et al. (2005). Sleep hygiene practices in a population-based sample of insomniacs. *Sleep: Journal of Sleep and Sleep Disorders Research, 28*(5), 611-615.

Johnson, B. A. (1999). Neuropsychological findings in Vietnam veterans with combat-related posttraumatic stress disorder. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60*(2-B), 0832.

Jokinen, T., Saarenapaa Heikkila, O., & Laippala, P. (1999). A new visual performance test offers new variables for assessing daytime vigilance: Short pauses in performance. *Behavior Research Methods, Instruments and Computers, 31*(1), 122-128.

Jones, A. W., & Neri, A. (1994). Age related differences in the effects of ethanol on performance and behaviour in healthy men. *Alcohol and Alcoholism, 29*(2), 171-179.

Jones, B. T., & Schulze, D. (2000). Alcohol-related words of positive affect are more accessible in social drinkers' memory than are other words when sip-primed by alcohol. *Addiction Research, 8*(3), 221-232.

Jubis, R. M. (1990). Effects of alcohol and white noise on recall of relevant and irrelevant task components. *Perceptual and Motor Skills, 71*(2), 691-702.

Kaemingk, K. L., Mulvaney, S., & Halverson, P. T. (2003). Learning following prenatal alcohol exposure: performance on verbal and visual multitrial tasks. *Archives of Clinical Neuropsychology, 18*(1), 33-47.

Kahler, C. W. (1999). Motivation for change in excessive drinkers: Assessing the role of explicit memory processes. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(12-B), 6490.

Kalmijn, S., van Boxtel, M. P., Verschuren, M. W., Jolles, J., & Launer, L. J. (2002). Cigarette smoking and alcohol consumption in relation to cognitive performance in middle age. *American Journal of Epidemiology, 156*(10), 936-944.

Kaplan Estrin, M., Jacobson, S. W., & Jacobson, J. L. (1999). Neurobehavioral effects of prenatal alcohol exposure at 26 months. *Neurotoxicology and Teratology, 21*(5), 503-511.

Karlqvist, L. K., Harenstam, A., Leijon, O., & Scheele, P. (2003). Excessive physical demands in modern worklife and characteristics of work and living conditions of persons at risk. *Scandinavian Journal of Work, Environment and Health, 29*(5), 363-377.

Karwacki, S. B. (1992). Relationships between motivations, goal attainment expectancies and coping and substance use and binge eating in college students. *Dissertation Abstracts International, 52*(8-B), 4471.

Kaskutas, L., & Greenfield, T. K. (1992). First effects of warning labels on alcoholic beverage containers. *Drug and Alcohol Dependence, 31*(1), 1-14.

Keane, T. M., & Lisman, S. A. (1980). Alcohol and social anxiety in males: behavioral, cognitive, and physiological effects. *Journal of Abnormal Psychology, 89*(2), 213-223.

Kelly, T. H., & Cherek, D. R. (1993). The effects of alcohol on free-operant aggressive behavior. *Journal of Studies on Alcohol, S11*, 40-52.

Kelly, T. H., Cherek, D. R., & Steinberg, J. L. (1987). Alcohol effects on human aggressive behavior: influence of concurrent fixed-ratio reinforcement contingencies. *NIDA Research Monograph, 76*, 109-115.

Kelly, T. H., Cherek, D. R., & Steinberg, J. L. (1989). Concurrent reinforcement and alcohol: interactive effects on human aggressive behavior. *Journal of Studies on Alcohol, 50*(5), 399-405.

Kenna, G. A. (2004). Prevalence and risk factors associated with substance use and abuse by Rhode Island health care professionals. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64*(8-B), 4091.

Kerr, J. S., & Hindmarch, I. (1998). The effects of alcohol alone or in combination with other drugs on information processing, task performance and subjective responses. *Human Psychopharmacology: Clinical and Experimental, 13*(1), 1-9.

Khan, S. A., & Timney, B. (2007). Alcohol slows interhemispheric transmission, increases the flash-lag effect, and prolongs masking: Evidence for a slowing of neural processing and transmission. *Vision Research, 47*(13), 1821-1832.

Kiefer, F., Jahn, H., Koester, A., Montkowski, A., Reinscheid, R. K., & Wiedemann, K. (2003). Involvement of NMDA receptors in alcohol-mediated behavior: mice with reduced affinity of the NMDA R1 glycine binding site display an attenuated sensitivity to ethanol. *Biological Psychiatry, 53*(4), 345-351.

King, R. D., Jr. (1996). Hyper-reactivity, Pavlovian conditioning, and endogenous opioids in a rodent model of alcohol self-administration. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(1-B), 0736.

Kirk, J. M. (1997). Possible factors affecting humans' self-control for food: Deprivation level, mood, and alcohol consumption. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(11-B), 7254.

Kixmiller, J. S., Verfaellie, M., Chase, K. A., & Cermak, L. S. (1995). Comparison of figural intrusion errors in three amnesic subgroups. *Journal of the International Neuropsychological Society, 1*(6), 561-567.

Knox, P. C. (1997). Reducing craving and recidivism with naltrexone in inpatient alcoholism treatment, a clinical study. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(10-B), 6579.

Kocher, H., Warwick, J., Al Ghnaniem, R., & Patel, A. (2006). Surgical dexterity after a 'night out on the town'. *ANZ Journal of Surgery, 76*(3), 110-112.

Kodituwakku, P. W., Handmaker, N. S., Cutler, S. K., Weathersby, E. K., & Handmaker, S. D. (1995). Specific impairments in self-regulation in children exposed to alcohol prenatally. *Alcoholism: Clinical and Experimental Research, 19*(6), 1558-1564.

Kodituwakku, P. W., Kalberg, W., & May, P. A. (2001). The effects of prenatal alcohol exposure on executive functioning. *Alcohol Research and Health, 25*(3), 192-198.

Kodituwakku, P. W., May, P. A., Clericuzio, C. L., & Weers, D. (2001). Emotion-related learning in individuals prenatally exposed to alcohol: an investigation of the relation between set shifting, extinction of responses, and behavior. *Neuropsychologia, 39*(7), 699-708.

Koelega, H. S. (1995). Alcohol and vigilance performance: a review. *Psychopharmacology, 118*(3), 233-249.

Kopelman, M. D. (1991). Non-verbal, short-term forgetting in the alcoholic Korsakoff syndrome and Alzheimer-type dementia. *Neuropsychologia, 29*(8), 737-747.

Kopelman, M. D., Stanhope, N., & Kingsley, D. (1997). Temporal and spatial context memory in patients with focal frontal, temporal lobe, and diencephalic lesions. *Neuropsychologia, 35*(12), 1533-1545.

Korytnyk, N. X., & Perkins, D. V. (1983). Effects of alcohol versus expectancy for alcohol on the incidence of graffiti following an experimental task. *Journal of Abnormal Psychology, 92*(3), 382-385.

Kramer, D. A., & Goldman, M. S. (2003). Using a modified Stroop task to implicitly discern the cognitive organization of alcohol expectancies. *Journal of Abnormal Psychology, 112*(1), 171-175.

Kremen, W. S., Jacobsen, K. C., Xian, H., Eisen, S. A., Eaves, L. J., Tsuang, M. T., et al. (2007). Genetics of verbal working memory processes: A twin study of middle-aged men. *Neuropsychology . Vol, 21*(5), 569-580.

Kreutzer, J. S. (1983). The effects of alcohol on performance and performance awareness. *Dissertation Abstracts International, 43*(8-B), 2710.

Kreutzer, J. S., Schneider, H. G., & Myatt, C. R. (1984). Alcohol, aggression and assertiveness in men: dosage and expectancy effects. *Journal of Studies on Alcohol, 45*(3), 275-278.

Kronholm, E., Harma, M., Hublin, C., Aro, A. R., & Partonen, T. (2006). Self-reported sleep duration in Finnish general population. *Journal of Sleep Research, 15*(3), 276-290.

Krull, K. R., Smith, L. T., Sinha, R., & Parsons, O. A. (1993). Simple reaction time event-related potentials: effects of alcohol and sleep deprivation. *Alcoholism: Clinical and Experimental Research, 17*(4), 771-777.

Kruse, M. I., & Fromme, K. (2005). Influence of physical attractiveness and alcohol on men's perceptions of potential sexual partners and sexual behavior intentions. *Experimental and Clinical Psychopharmacology, 13*(2), 146-156.

Kubicek, K. R. (1998). Self-defined attributes of success: A phenomenological study of long-term recovering alcoholics. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(1-B), 0435.

Kubo, T., Sakata, Y., Koshimune, A., Sakai, S., Ameno, K., & Ijiri, I. (1990). Positional nystagmus and body sway after alcohol ingestion. *American Journal of Otolaryngology, 11*(6), 416-419.

Kuitunen, T., Mattila, M. J., Seppala, T., Aranko, K., & Mattila, M. E. (1990). Actions of zopiclone and carbamazepine, alone and in combination, on human skilled performance in laboratory and clinical tests. *British Journal of Clinical Pharmacology, 30*(3), 453-461.

Kushner, M. G., Mackenzie, T. B., Fiszdon, J., Valentiner, D. P., Foa, E., et al. (1996). The effects of alcohol consumption on laboratory-induced panic and state anxiety. *Archives of General Psychiatry, 53*(3), 264-270.

Kuther, T. L. (1998). The influence of cognitive, affective, and developmental factors on alcohol consumption by adolescents and young adults. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(3-B), 1392.

Lamberty, G. J., Beckwith, B. E., & Petros, T. V. (1990). Posttrial treatment with ethanol enhances recall of prose narratives. *Physiology and Behavior, 48*, 653-658.

Landauer, A. A., & Milner, G. (1971). Desipramine and imipramine, alone and together with alcohol in relation to driving safety. *Pharmakopsychiatrie, Neuro-Psychopharmakologie, 4*, 265-275.

Lang, A. R., Searles, J., Lauerman, R., & Adesso, V. (1980). Expectancy, alcohol, and sex guilt as determinants of interest in and reaction to sexual stimuli. *Journal of Abnormal Psychology, 89*(5), 644-653.

Lanier, S. A., Hayes, J. E., & Duffy, V. B. (2005a). Sweet and bitter tastes of alcoholic beverages mediate alcohol intake in of-age undergraduates. *Physiology and Behavior, 83*(5), 821-831.

Lanier, S. A., Hayes, J. E., & Duffy, V. B. (2005b). Sweet and bitter tastes of alcoholic beverages mediate alcohol intake in of-age undergraduates. *Physiology and Behavior, 83*(5), 821-831.

Lansky, D., & Wilson, G. T. (1981). Alcohol, expectations, and sexual arousal in males: an information processing analysis. *Journal of Abnormal Psychology, 90*(1), 35-45.

Lattal, K. M., Radulovic, J., & Lukowiak, K. (2006). Extinction: Does it or doesn't it? The requirement of altered gene activity and new protein synthesis. *Biological Psychiatry, 60*(4), 344-351.

Lau, M. A. (1996). Neuropsychological performance, acute alcohol intoxication and aggression in adult males. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 57*(4-B), 2930.

Lawton Craddock, A. J. (2003). Nicotine's effects on neurocognitive performance in alcoholics. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64*(6-B), 2976.

Le, J., & Cao, N. (2002). The effects of "alcohol myopia" and "alcohol hyperopia" in arithmetic operation-cognition. *Psychological Science (China), 25*(3), 293-295.

Leibowitz, H. W., & al., e. (1992). Contrast sensitivity during locomotion: The effect of alcohol. *Investigative Ophthalmology and Visual Science, 33*, 1415.

Leigh, B. C., & Stacy, A. W. (1998). Individual differences in memory associations involving the positive and negative outcomes of alcohol use. *Psychology of Addictive Behaviors, 12*(1), 39-46.

Li, G., Baker, S. P., Lamb, M. W., Qiang, Y., & McCarthy, M. L. (2005). Characteristics of alcohol-related fatal general aviation crashes. *Accident; analysis and prevention, 37*(1), 143-148.

Lichtor, J. L., Zacny, J., Apfelbaum, J. L., Lane, B. S., Rupani, G., Thisted, R. A., et al. (1991). Alcohol after sedation with i.v. midazolam-fentanyl: effects on psychomotor functioning. *British Journal of Anaesthesia, 67*(5), 579-584.

Ling, J., Hefferman, T. M., Buchanan, T., Rodgers, J., Scholey, A. B., & Parrott, A. C. (2003). Effects of alcohol on subjective ratings of prospective and everyday memory deficits. *Alcoholism: Clinical and Experimental Research, 27*(6), 970-974.

Linnoila, M., Stapleton, J. M., George, D. T., Lane, E., & Eckardt, M. J. (1993). Effects of fluvoxamine, alone and in combination with ethanol, on psychomotor and cognitive performance and on autonomic nervous system reactivity in healthy volunteers. *Journal of Clinical Psychopharmacology, 13*(3), 175-180.

Lotsch, J., & Hummel, T. (2006). The clinical significance of electrophysiological measures of olfactory function. *Behavioural Brain Research, 170*(1), 78-83.

Lu, C. S., & Chu, N. S. (1991). Effects of alcohol on myoclonus and somatosensory evoked potentials in dyssynergia cerebellaris myoclonica. *Journal of Neurology, Neurosurgery and Psychiatry, 54*(10), 905-908.

Luecke, S. O. (1993). *Über die Wirkung geringer Alkoholdosen auf die sakkadischen Augenbewegungen in Leistungsaufgaben. [Effects of small doses of alcohol on the saccadic eye movements in performance tasks].* Unpublished Dissertation, Freiburg, Schweiz.

Luke, D. P., & Kittenis, M. (2005). A preliminary survey of paranormal experiences with psychoactive drugs. *Journal of Parapsychology, 69*(2), 305-327.

Lutz, F. U., Rahn, R., & Taupp, W. (1991). Wirkung niedriger Blutalkoholkonzentrationen in Abhängigkeit von der Tageszeit. [Effect of low blood alcohol concentrations in relation to time of day]. *Blutalkohol, 28*(4), 235-242.

MacDonald, T. K., Fong, G. T., Zanna, M. P., & Martineau, A. M. (2000). Alcohol myopia and condom use: Can alcohol intoxication be associated with more prudent behavior? *Journal of Personality and Social Psychology, 78*(4), 605-619.

Maisto, S. A., Carey, M. P., Carey, K. B., & Gordon, C. M. (2002). The effects of alcohol and expectancies on risk perception and behavioral skills relevant to safer sex among heterosexual young adult women. *Journal of Studies on Alcohol, 63*(4), 476-485.

Mallach, H. J., Schmidt, V., Schenzle, D., & Dietz, K. (1983). Untersuchungen zur Prüfung der Wechselwirkung zwischen Alkohol und einem neuen 1,4 Benzodiazepin (Metaclazepam). 2. Mitteilung: Psychophysische Leistungsfähigkeit. *Blutalkohol, 20*, 196-220.

Martin, C. S., & Earleywine, M. (1990). Ascending and descending rates of change in blood alcohol concentrations and subjective intoxication ratings. *Journal of Substance Abuse, 2*(3), 345-352.

Martin, C. S., Rose, R. J., & Obremski, K. M. (1991). Estimation of blood alcohol concentrations in young male drinkers. *Alcoholism: Clinical and Experimental Research, 15*(3), 494-499.

Mattila, M. J., & Mattila Evenden, M. E. (1997). Effects of alcohol and hypnosedative drugs on digit-symbol substitution: Comparison of two different computerized tests. *Journal of Psychopharmacology, 11*(4), 313-317.

Maughan, R. J., Leiper, J. B., & Shirreffs, S. M. (1997). Factors influencing the restoration of fluid and electrolyte balance after exercise in the heat. *British Journal of Sports Medicine, 31*(3), 175-182.

McCarty, D., Diamond, W., & Kaye, M. (1982). Alcohol, sexual arousal, and the transfer of excitation. *Journal of Personality and Social Psychology, 42*(6), 977-988.

McKinney, A., & Coyle, K. (2004). Next day effects of a normal night's drinking on memory and psychomotor performance. *Alcohol and Alcoholism, 39*(6), 509-513.

McNamee, J. E., Piggins, D., & Tong, J. (1981). Confirmation of the influence of alcohol on heterophoria using a vision screener. *American Journal of Optometry and Physiological Optics, 58*(9), 761-765.

Mendelson, J., Jones, R. T., Upton, R., & Jacob, P., 3rd (1995). Methamphetamine and ethanol interactions in humans. *Clinical Pharmacology and Therapeutics, 57*(5), 559-568.

Merenstein, D. (2006). Heavy night call vs alcohol ingestion in residents. *Journal of the American Medical Association, 295*(2), 162.

Meyer, M. J. (1998). Perceptual differences in fetal alcohol effect boys performing a modeling task. *Perceptual and Motor Skill, 87*(3 Pt 1), 784-786.

Michael, G. A., Jacquot, L., Millot, J. L., & Brand, G. (2005). Ambient odors influence the amplitude and time course of visual distraction. *Behavioral Neuroscience, 119*(3), 708-715.

Milgram, G. G. (1993). Adolescents, alcohol and aggression. *Journal of Studies on Alcohol, S11*, 53-61.

Mimura, M., Komatsu, S., Kato, M., Yoshimasu, H., Moriyama, Y., & Kashima, H. (2005). Further evidence for a comparable memory advantage of self-performed tasks in Korsakoff's syndrome and nonamnesic control subjects. *Journal of the International Neuropsychological Society, 11*(5), 545-553.

Moeller, F., & Dougherty, D. M. (2001). Antisocial personality disorder, alcohol, and aggression. *Alcohol Research and Health, 25*(1), 5-11.

Moeller, F., Dougherty, D. M., Lane, S. D., Steinberg, J. L., & Cherek, D. R. (1998). Antisocial personality disorder and alcohol-induced aggression. *Alcoholism: Clinical and Experimental Research, 22*(9), 1898-1902.

Mortimer, R. G., & S.P., S. (1975). *Effects of alcohol on safe driving skills*. Rockville, Md.: National Institute of Alcohol Abuse and Alcoholism.

Moskowitz, H., & Burns, M. (1990). Effects of alcohol on driving performance. *Alcohol Health and Research World, 14*(1), 12-14.

Moskowitz, H., & Fiorentino, D. (2000). *A review of the literature on the effects of low doses of alcohol on driving-related skills* (No. DOT HS 809028): National Highway Traffic Safety Administration (NHTSA).

Moskowitz, H., Sharma, S., & Schapero, M. (1972). A comparison of the effects of marijuana and alcohol on visual functions. In M. Lewis (Ed.), *Current Research in Marijuana* (pp. 129-150). New York: Academic Press.

Mulligan, N. W., & Lozito, J. P. (2006). An asymmetry between memory encoding and retrieval: Revelation, generation, and transfer-appropriate processing. *Psychological Science, 17*(1), 7-11.

Mulvihill, L. E., & Vogel-Sprott, M. (1996). Alcohol impairs and caffeine improves the ability to inhibit behavior. *Alcoholism: Clinical & Experimental Research, 20*, 107.

Mumenthaler, M. S., Taylor, J. L., O'Hara, R., & Yesavage, J. A. (1999). Gender differences in moderate drinking effects. *Alcohol Research and Health, 23*(1), 55-64.

Mumenthaler, M. S., Yesavage, J. A., Taylor, J. L., O'Hara, R., Friedman, L., Lee, H., et al. (2003). Psychoactive drugs and pilot performance: A comparison of nicotine, donepezil, and alcohol effects. *Neuropsychopharmacology, 28*(7), 1366-1373.

Mundt, J. C., Perrine, M. W., & Searles, J. S. (1997). Individual differences in alcohol responsivity: physiological, psychomotor and subjective response domains. *Journal of Studies on Alcohol, 58*(2), 130-140.

Muntaner, C., Higgins, S. T., Roache, J. D., & Henningfield, J.-E. (1991). Ethanol decreases responding on behavior maintained under concurrent schedules of both positive reinforcer presentation and avoidance in humans. *Behavioural Pharmacology, 2*(1), 47-56.

Muraven, M., Collins, R. L., & Nienhaus, K. (2002). Self-control and alcohol restraint: an initial application of the self-control strength model. *Psychology of Addictive Behaviors, 16*(2), 113-120.

Myrsten, A. L., Hollstedt, C., & Holmberg, L. (1975). Alcohol-induced changes in mood and activation in males and females as related to catecholamine excretion and blood-alcohol level. *Scandinavian Journal of Psychology, 16*(4), 303-310.

Nagoshi, C. T., Wilson, J. R., & Rodriguez, L. A. (1991). Impulsivity, sensation seeking, and behavioral and emotional responses to alcohol. *Alcoholism: Clinical and Experimental Research, 15*(4), 661-667.

Naranjo, C. A., & Bremner, K. E. (1993). Behavioural correlates of alcohol intoxication. *Addiction, 88*(1), 25-35.

Neighbors, C., Walker, D. D., & Larimer, M. E. (2003). Expectancies and evaluations of alcohol effects among college students: Self-determination as a moderator. *Journal of Studies on Alcohol, 64*(2), 292-299.

Newland, M. C., & Weiss, B. (1991). Ethanol's effects on tremor and positioning in squirrel monkeys. *Journal of Studies on Alcohol, 52*(5), 492-499.

Ngandu, T., Helkala, E. L., Soininen, H., Winblad, B., Tuomilehto, J., Nissinen, A., et al. (2007). Alcohol drinking and cognitive functions: findings from the Cardiovascular Risk Factors Aging and Dementia (CAIDE) Study. *Dementia and Geriatric Cognitive Disorders, 23*(3), 140-149.

Nixon, S. J., & Bowlby, D. (1996). Evidence of alcohol-related efficiency deficits in an episodic learning task. *Alcoholism: Clinical and Experimental Research, 20*(1), 21-24.

Noel, N. E., Lisman, S. A., Schare, M. L., & Maisto, S. A. (1992). Effects of alcohol consumption on the prevention and alleviation of stress-reactions. *Addictive Behaviors, 17*(6), 567-577.

Noel, X., Van der Linden, M., Schmidt, N., Sferrazza, R., Hanak, C., Le Bon, O., et al. (2001). Supervisory attentional system in nonamnesic alcoholic men. *Archives of General Psychiatry, 58*(12), 1152-1158.

Noland, J. S., Singer, L. T., Arendt, R. E., Minnes, S., Short, E. J., & Bearer, C. F. (2003). Executive functioning in preschool-age children prenatally exposed to alcohol, cocaine, and marijuana. *Alcoholism: Clinical and Experimental Research, 27*(4), 647-656.

Noland, J. S., Singer, L. T., Mehta, S. K., & Super, D. M. (2003). Prenatal cocaine/polydrug exposure and infant performance on an executive functioning task. *Developmental Neuropsychology, 24*(1), 499-517.

Norlander, T., & Gustafson, R. (1996). Effects of alcohol on scientific thought during the incubation phase of the creative process. *Journal of Creative Behavior, 30*(4), 231-248.

Norlander, T., & Gustafson, R. (1997). Effects of alcohol on picture drawing during the verification phase of the creative process. *Creativity Research Journal, 10*(4), 355-362.

Norlander, T., & Gustafson, R. (1998). Effects of alcohol on a divergent figural fluency test during the illumination phase of the creative process. *Creativity Research Journal, 11*(3), 265-274.

O'Brien, C. P. (1993). Alcohol and sport. Impact of social drinking on recreational and competitive sports performance. *Sports Medicine, 15*(2), 71-77.

O'Brien, C. P., & Lyons, F. (2000). Alcohol and the athlete. *Sports Medicine, 29*(5), 295-300.

Ogden, E. J., & Moskowitz, H. (2004). Effects of alcohol and other drugs on driver performance. *Traffic Injury Prevention, 5*(3), 185-198.

Ogle, R. L., & Miller, W. R. (2004). The effects of alcohol intoxication and gender on the social information processing of hostile provocations involving male and female provocateurs. *Journal of Studies on Alcohol, 65*(1), 54-62.

Oinonen, K. A., & Sterniczuk, R. (2007). An inverse relationship between typical alcohol consumption and facial symmetry detection ability in young women. *Journal of Psychopharmacology, 21*(5), 507-518.

Olpin, S. E., Pollitt, R. J., McMenamin, J., Manning, N. J., Besley, G., Ruiter, J. P., et al. (2002). 2-methyl-3-hydroxybutyryl-CoA dehydrogenase deficiency in a 23-year-old man. *Journal of Inherited Metabolic Disease, 25*(6), 477-482.

Oscar Berman, M., Hutner, N., & Bonner, R. T. (1992). Visual and auditory spatial and nonspatial delayed-response performance by Korsakoff and non-Korsakoff alcoholic and aging individuals. *Behavioral Neuroscience, 106*(4), 613-622.

Oscar Berman, M., & Pulaski, J. L. (1997). Association learning and recognition memory in alcoholic Korsakoff patients. *Neuropsychology, 11*(2), 282-289.

Ozkaragoz, T., Satz, P., & Noble, E. P. (1997). Neuropsychological functioning in sons of active alcoholic, recovering alcoholic, and social drinking fathers. *Alcohol, 14*(1), 31-37.

Paez, A. M., Shannon, M., Maher, T., & Quang, L. (2004). Effects of 4-methylpyrazole on ethanol neurobehavioral toxicity in CD-1 mice. *Academic Emergency Medicine, 11*(8), 820-826.

Paganini Hill, A., & Henderson, V. W. (1996). The effects of hormone replacement therapy, lipoprotein cholesterol levels, and other factors on a clock drawing task in older women. *Journal of the American Geriatrics Society, 44*(7), 818-822.

Palfai, T. P., Monti, P. M., Colby, S. M., & Rohsenow, D. J. (1997). Effects of suppressing the urge to drink on the accessibility of alcohol outcome expectancies. *Behaviour Research and Therapy, 35*(1), 59-65.

Palfai, T. P., & Ostafin, B. D. (2003). The influence of alcohol on the activation of outcome expectancies: The role of evaluative expectancy activation in drinking behavior. *Journal of Studies on Alcohol, 64*(1), 111-119.

Pallares, M., Darbra, S., Prat, G., & Ferre, N. (2001). Immediate and delayed voluntary ethanol effects on motor performance, learning and inhibition in rats. *Pharmacology Biochemistry and Behavior, 69*(1-2), 41-49.

Park, C. L. (2004). Positive and negative consequences of alcohol consumption in college students. *Addictive Behaviors, 29*(2), 311-321.

Parker, D. A., Harford, T. C., & Rosenstock, I. M. (1994). Alcohol, other drugs, and sexual risk-taking among young adults. *Journal of Substance Abuse, 6*(1), 87-93.

Parrott, D. J., Zeichner, A., & Stephens, D. (2003). Effects of alcohol, personality, and provocation on the expression of anger in men: A facial coding analysis. *Alcoholism: Clinical and Experimental Research, 27*(6), 937-945.

Parry, G. J., & Ogston, S. A. (1992). EUROMAC. A European concerted action: maternal alcohol consumption and its relation to the outcome of pregnancy and child development at 18 months. Results--child development at age 18 months. *International Journal of Epidemiolog, 21 Suppl 1*, 72-78.

Pavlik, V. N., Hyman, D. J., & Doody, R. (2005). Cardiovascular risk factors and cognitive function in adults 30-59 years of age (NHANES III). *Neuroepidemiology, 24*(1-2), 42-50.

Penttila, A., Kuoppasalmi, K., & Vuori, E. (1999). Alkoholi, laakkeet ja huumeet liikenteessa. *Duodecim, 115*(6), 693-700.

Perrine, M. W., Mundt, J. C., & Weiner, R. I. (1994). When alcohol and water don't mix: diving under the influence. *Journal of Studies on Alcohol, 55*(5), 517-524.

Pfefferbaum, A., Desmond, J. E., Galloway, C., Menon, V., Glover, G. H., & Sullivan, E. V. (2001). Reorganization of frontal systems used by alcoholics for spatial working memory: an fMRI study. *Neuroimage, 14*(Pt 1), 7-20.

Pihl, R. O., & Lemarquand, D. (1998). Serotonin and aggression and the alcohol-aggression relationship. *Alcohol and Alcoholism, 33*(1), 55-65.

Pihl, R. O., Young, S. N., Harden, P., Plotnick, S., et al. (1995). Acute effect of altered tryptophan levels and alcohol on aggression in normal human males. *Psychopharmacology, 119*(4), 353-360.

Pohorecky, L. A., & Roberts, P. (1991). Development of tolerance to and physical dependence on ethanol: daily versus repeated cycles treatment with ethanol. *Alcoholism: Clinical and Experimental Research, 15*(5), 824-833.

Popke, E. J. (1998). Effects of nicotine and ethanol on indices of reward and sensory-motor function in rats: Implications for the positive epidemiologic relationship between the use of cigarettes and the use of alcohol. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(4-B), 1907.

Popke, E. J., Allen, S. R., & Paule, M. G. (2000). Effects of acute ethanol on indices of cognitive-behavioral performance in rats. *Alcohol, 20*(2), 187-192.

Post, R. B., Lott, L. A., Beede, J. I., & Maddock, R. J. (1994). The effect of alcohol on the vestibulo-ocular reflex and apparent concomitant motion. *Journal of Vestibular Research: Equilibrium and Orientation, 4*(3), 181-187.

Post, R. B., Tavano, L. A., & Maddock, R. J. (1998). Role of feedback in formation of acute tolerance to alcohol. *Journal of Studies on Alcohol, , 59*(6), 723-730.

Powell, N. B., Riley, R. W., Schechtman, K. B., Blumen, M. B., Dinges, D. F., & Guilleminault, C. (1999). A comparative model: reaction time performance in sleep-disordered breathing versus alcohol-impaired controls. *Laryngoscope, 109*(10), 1648-1654.

Quinones, B. (1999). The effects of alcohol on men's imposition of sexually explicit material on a female confederate: The role of "suggestive" and "nonsuggestive" cues. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 59*(7-B), 3710.

Rachmiel, T. B. (1997). Effects of alcohol cues and expectancy words on Stroop color naming. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(5-B), 2696.

Radcliffe, R. A., Erwin, V. G., Draski, L., Hoffmann, S., Edwards, J., Deng, X. S., et al. (2004). Quantitative trait loci mapping for ethanol sensitivity and neurotensin receptor density in an F2 intercross derived from inbred high and low alcohol sensitivity selectively bred rat lines. *Alcoholism: Clinical and Experimental Research, 28*(12), 1796-1804.

Rahman, M. A., Grunberg, N. E., & Mueller, G. P. (1997). Disulfiram causes sustained behavioral and biochemical effects in rats. *Pharmacology Biochemistry and Behavior, 56*(3), 409-415.

Rajendran, R., & Cherian, R. R. (1990). Nature of memory impairment in group of hospitalised alcoholics. *Indian Journal of Clinical Psychology, 17*(1), 33-36.

Ramaekers, J. G. (2003). Antidepressants and driver impairment: empirical evidence from a standard on-the-road test. *Journal of Clinical Psychiatry, 64*(1), 20-29.

Ramaekers, J. G., Kuypers, K. P., & Samyn, N. (2006). Stimulant effects of 3,4-methylenedioxymethamphetamine (MDMA) 75 mg and methylphenidate 20 mg on actual driving during intoxication and withdrawal. *Addiction, 101*(11), 1614-1621.

Ramchandani, V. A., Flury, L., Morzorati, S. L., Kareken, D., Blekher, T., Foroud, T., et al. (2002). Recent drinking history: association with family history of alcoholism and the acute response to alcohol during a 60 mg% clamp. *Journal of Studies on Alcohol, 63*(6), 734-744.

Ramchandani, V. A., O'Connor, S., Blekher, T., Kareken, D., Morzorati, S., Nurnberger, J., Jr., et al. (1999). A preliminary study of acute responses to clamped alcohol concentration and family history of alcoholism. *Alcoholism: Clinical and Experimental Research, 23*(8), 1320-1330.

Reeves, S. B., & Nagoshi, C. T. (1993). Effects of alcohol administration on the disinhibition of racial prejudice. *Alcoholism: Clinical and Experimental Research, 17*(5), 1066-1071.

Regan, M. F. (1997). Evidence for a cerebellar contribution to the neuropsychological performance of children with fetal alcohol syndrome. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(4-B), 2171.

Reich, R. R. (2003). Alcohol expectancies and implicit memory: Using a false memory approach to examine the implicit nature of alcohol expectancies in different contexts. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64*(1-B), 429.

Reich, R. R., Noll, J. A., & Goldman, M. S. (2005). Cue patterns and alcohol expectancies: How slight differences in stimuli can measurably change cognition. *Experimental and Clinical Psychopharmacology, 13*(1), 65-71.

Reid, M. C., Van Ness, P. H., Hawkins, K. A., Towle, V., Concato, J., & Guo, Z. (2006). Light to Moderate Alcohol Consumption Is Associated With Better Cognitive Function Among Older Male Veterans Receiving Primary Care. *Journal of Geriatric Psychiatry and Neurology, 19*(2), 98-105.

Reiser, D. M. (1998). Denial, drinking behavior, and emotional symptomatology in daughters of alcoholics. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(12-B), 6822.

Remington, B., Roberts, P., & Glautier, S. (1997). The effect of drink familiarity on tolerance to alcohol. *Addictive Behaviors, 22*(1), 45-53.

Reyes, E., Duran, E., & Switzer, S. H. (1993). Effects of in utero administration of alcohol on alcohol sensitivity in adult rats. *Pharmacology Biochemistry and Behavior, 44*(2), 307-312.

Rhodes, J. S., Ford, M. M., Yu, C. H., Brown, L. L., Finn, D. A., Garland, T., Jr., et al. (2007). Mouse inbred strain differences in ethanol drinking to intoxication. *Genes, Brain and Behavior, 6*(1), 1-18.

Ridderinkhof, K. R., de Vlugt, Y., Bramlage, A., Spaan, M., Elton, M., Snel, J., et al. (2002). Alcohol consumption impairs detection of performance errors in mediofrontal cortex. *Science, 298*(5601), 2209-2211.

Ridout, F., Gould, S., Nunes, C., & Hindmarch, I. (2003). The effects of carbon dioxide in champagne on psychometric performance and blood-alcohol concentration. *Alcohol and Alcoholism, 38*(4), 381-385.

Ridout, F., Shamsi, Z., Meadows, R., Johnson, S., & Hindmarch, I. (2003). A single-center, randomized, double-blind, placebo-controlled, crossover investigation of the effects of fexofenadine hydrochloride 180 mg alone and with alcohol, with hydroxyzine hydrochloride 50 mg as a positive internal control, on aspects of cognitive and psychomotor function related to driving a car. *Clinical Therapeutics: The International Peer Reviewed Journal of Drug Therapy, 25*(5), 1518-1538.

Riesselmann, B., Rosenbaum, F., & Schneider, V. (1996). Alkohol und Energy Drink – Kann der gemeinsame Konsum beider Getränke die Fahrtüchtigkeit beeinträchtigen? [Alcohol and energy drink – can combined consumption of both beverages modify automobile driving fitness?]. *Blutalkohol, 33*(4), 201-208.

Rimm, D., Briddell, D., Zimmerman, M., & Caddy, G. (1981). The effects of alcohol and the expectancy of alcohol on snake fear. *Addictive Behaviors, 6*(1), 47-51.

Rio, M. C., Gonzalez Luque, J. C., & Alvarez, F. J. (2001). Alcohol-related problems and fitness to drive. *Alcohol and Alcoholism, 36*(3), 256-261.

Ritchie, K. A., Burke, F. J., Gilmour, W. H., Macdonald, E. B., Dale, I. M., Hamilton, R. M., et al. (2004). Mercury vapour levels in dental practices and body mercury levels of dentists and controls. *British Dental Journal, 197*(10), 625-632.

Ritz Timme, S., Thome, M., Grutters, G., Grutters, M., Reichelt, J. A., Bilzer, N., et al. (2006). What shall we do with the drunken sailor? Effects of alcohol on the performance of ship operators. *Forensic Science International, 156*(1), 16-22.

Roach, G. D., Dorrian, J., Fletcher, A., & Dawson, D. (2001). Comparing the effects of fatigue and alcohol consumption on locomotive engineers' performance in a rail simulator. *Journal of Human Ergology, 30*(1-2), 125-130.

Rodriguez, L. A., Wilson, J. R., & Nagoshi, C. T. (1993). Does psychomotor sensitivity to alcohol predict subsequent alcohol use? *Alcoholism: Clinical and Experimental Research, 17*(1), 155-161.

Roebuck Spencer, T. M., Mattson, S. N., Marion, S. D., Brown, W. S., & Riley, E. P. (2004). Bimanual coordination in alcohol-exposed children: role of the corpus callosum. *Soc International Neuropsychological Society, 10*(4), 536-548.

Rohsenow, D. J., & Bachorowski, J. A. (1984). Effects of alcohol and expectancies on verbal aggression in men and women. *Journal of Abnormal Psychology, 93*(4), 418-432.

Rohsenow, D. J., Howland, J., Minsky, S. J., & Arnedt, J. T. (2006). Effects of heavy drinking by maritime academy cadets on hangover, perceived sleep, and next-day ship power plant operation. *Journal of Studies on Alcohol and Drugs, 67*(3), 406-415.

Roquelaure, Y., Le Gargasson, J. F., Kupper, S., Girre, C., Hispard, E., & Dally, S. (1995). Alcohol consumption and visual contrast sensitivity. *Alcohol and Alcoholism, 30*(5), 681-685.

Rorick, L. M., Finn, P. R., & Steinmetz, J. E. (2003). Moderate doses of ethanol partially reverse avoidance learning deficits in high-alcohol-drinking rats. *Pharmacology, Biochemistry and Behavior, 75*(1), 89-102.

Rose, A. K., & Duka, T. (2006). Effects of dose and time on the ability of alcohol to prime social drinkers. *Behavioral Pharmacology, 17*(1), 61-70.

Ross, L. E., & Ross, S. M. (1992). Alcohol use and aviation safety. *Alcohol, Drugs and Driving, 8*(3-4), 231-239.

Roth, T., Roehrs, T., & Merlotti, L. (1990). Ethanol and daytime sleepiness. *Alcohol, Drugs and Driving, 5 & 6*(4 & 1), 357-362.

Ruffolo, L. F., Jr. (2004). Assessing the relationship between neuropsychological constructs and alcohol use among college students. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 64*(9-B), 4649.

Rush, C. R., & Ali, J. A. (1999). Naltrexone does not attenuate the acute behavioral effects of ethanol or pentobarbital in humans. *Behavioral Pharmacology, 10*(4), 401-413.

Rush, C. R., Kelly, T. H., Fillmore, M. T., & Hays, L. R. (2003). Discriminative-stimulus effects of triazolam in light and moderate drinkers. *Alcoholism: Clinical and Experimental Research, 27*(4), 638-646.

Ryan, C., Russo, K., & Greeley, J. (1996). Testing the global slowing hypothesis: Are alcohol's effects on human performance process specific or task general? *Acta Psychologica, 92*(1), 59-78.

Sardo, J. M. (1998). Intoxication and near-threshold priming: Alcohol's effects on spreading activation. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 58*(12-B), 6861.

Sayette, M. A. (1992). The effects of alcohol on social information processing. *Dissertation Abstracts International, 52*(12-B, Pt 1), 6670.

Sayette, M. A. (1993). An appraisal-disruption model of alcohol's effects on stress responses in social drinkers. *Psychological Bulletin, 114*(3), 459-476.

Sayette, M. A., Contrada, R. J., & Wilson, G. (1990). Alcohol and correspondence between self-report and physiological measures of anxiety. *Behaviour Research and Therapy, 28*(4), 351-354.

Sayette, M. A., Martin, C. S., Perrott, M. A., Wertz, J. M., & Hufford, M. R. (2001). A test of the appraisal-disruption model of alcohol and stress. *Journal of Studies on Alcohol, 62*(2), 247-256.

Sayette, M. A., Smith, D. W., Breiner, M. J., & Wilson, G. (1992). The effect of alcohol on emotional response to a social stressor. *Journal of Studies on Alcohol, 53*(6), 541-545.

Sayette, M. A., & Wilson, G. (1991). Intoxication and exposure to stress: Effects of temporal patterning. *Journal of Abnormal Psychology, 100*(1), 56-62.

Schendel, D. E., Stockbauer, J. W., Hoffman, H. J., Herman, A. A., Berg, C. J., & Schramm, W. F. (1997). Relation between very low birth weight and developmental delay among preschool children without disabilities. *American Journal of Epidemiology, 146*(9), 740-749.

Schinka, J. A., Belanger, H., Mortimer, J. A., & Borenstein Graves, A. (2003). Effects of the use of alcohol and cigarettes on cognition in elderly African American adults. *Journal of the International Neuropsychological Society, 9*(5), 690-697.

Schinka, J. A., Vanderploeg, R. D., Rogish, M., Graves, A. B., Mortimer, J. A., & Ordoric, P. I. (2002). Effects of the use of alcohol and cigarettes on cognition in elderly adults. *Journal of the International Neuropsychological Society, 8*(6), 811-818.

Schinka, J. A., Vanderploeg, R. D., Rogish, M., & Ordorica, P. I. (2002). Effects of alcohol and cigarette use on cognition in middle-aged adults. *Journal of the International Neuropsychological Society, 8*(5), 683-690.

Schneider, U., Bevilacqua, C., Jacobs, R., Karst, M., Dietrich, D. E., Becker, H., et al. (1999). Effects of fentanyl and low doses of alcohol on neuropsychological performance in healthy subjects. *Neuropsychobiology, 39*(1), 38-43.

Schneider, U., Wohlfahrt, K., Schulze Bonhage, A., Haacker, T., Caspary, A., Zedler, M., et al. (1998). Lack of psychotomimetic or impairing effects on psychomotor performance of acamprosate. *Pharmacopsychiatry, 31*(3), 110-113.

Schreckenberger, M., Amberg, R., Scheurich, A., Lochmann, M., Tichy, W., Klega, A., et al. (2004). Acute alcohol effects on neuronal and attentional processing: striatal reward system and inhibitory sensory interactions under acute ethanol challenge. *Neuropsychopharmacology, 29*(8), 1527-1537.

Schroeder, D. J., Gilson, R. D., Guedry, F. E., & Collins, W. E. (1973). Effects of alcohol on nystagmus and tracking performance during laboratory angular accelerations about the Y and Z axes. *Aerospace Medicine, 44*(5), 477-487.

Schuckit, M. A., Greenblatt, D., Gold, E., & Irwin, M. (1991). Reactions to ethanol and diazepam in healthy young men. *Journal of Studies on Alcohol, 52*(2), 180-187.

Schuckit, M. A., & Klein, J. L. (1991). Correlations between drinking intensity and reactions to ethanol and diazepam in healthy young men. *Neuropsychopharmacology, 4*(3), 157-163.

Schuckit, M. A., & Smith, T. L. (1996). An 8-year follow-up of 450 sons of alcoholic and control subjects. *Archives of General Psychiatry, 53*(3), 202-210.

Schuller, E., Drasch, G., von Meyer, L., & Anselm, D. (1979). Die Wirkung von Alkohol und Coffein auf den durch längere Fahrt ermüdeten Kraftfahrer. Eine Untersuchung am Fahrsimulator. *Beiträge zur gerichtlichen Medizin, 37*, 219-222.

Schuster, R., Schewe, G., Ludwig, O., Friedel, L., & Hellwege, J. (1991). Pkw-Fahrversuche zur Frage der alkoholbedingten Fahrunsicherheit bei Dunkelheitsfahrten. *Blutalkohol, 28*(5), 287-301.

Schweizer, T. A., Jolicur, P., Vogel Sprott, M., & Dixon, M. J. (2004). Fast, but error-prone, responses during acute alcohol intoxication: Effects of stimulus-response mapping complexity. *Alcoholism: Clinical and Experimental Research, 28*(4), 643-649.

Sdao Jarvie, K., & Vogel Sprott, M. (1992). Learning alcohol tolerance by mental or physical practice. *Journal of Studies on Alcohol, 53*(6), 533-540.

Seidl, S., Scheller, M., & Reinhardt, G. (1996). Die Selbsteinschätzung der Hohe der BAK bei akuter Alkoholisierung. [Self-assessment of blood alcohol content in acute alcoholic intoxication]. *Blutalkohol, 33*(1), 23-30.

Sekuler, R., & MacArthur, R. D. (1977). Alcohol retards visual recovery from glare by hampering target acquisition. *Nature, 270*(5636), 428-429.

Shillito, M. L., King, L. E., & Cameron, C. (1974). Effects of alcohol on choice reaction time. *Quarterly Journal of Experimental Psychology, 35*(3), 1023-1034.

Shirreffs, S. M., & Maughan, R. J. (2006). The effect of alcohol on athletic performance. *Current Sports Medicine Reports, 5*(4), 192-196.

Shuntich, R. J., & Taylor, S. P. (1972). The effects of alcohol on human physical aggression. *Journal of Experimental Research in Personality, 6*, 34-38.

Sidell, F. R., & Pless, J. E. (1971). Ethyl alcohol: blood levels and performance decrements after oral administration to man. *Psychopharmacologia, 19*(3), 246-261.

Sierra, J. C., Jimenez Navarro, C., & Martin Ortiz, J. D. (2002). Quality of sleep in university students: The importance of sleep hygiene. [Calidad del sueno en estudiantes universitarios: Importancia de la higiene del sueno]. *Salud Mental, 25*(6), 35-43.

Simmons, R. W., Thomas, J. D., Levy, S. S., & Riley, E. P. (2006). Motor response selection in children with fetal alcohol spectrum disorders. *Neurotoxicol Teratol, 28*(2), 278-285.

Simpson, C. D. (1975). The effects of alcohol upon hemispheric functional asymmetry in motor, sensory and cognitive tasks. *Dissertation Abstracts International, 35*(11-B), 5652.

Slade, J. (1995). Smoking, alcohol, and neuromuscular function in older women. *The Journal of the American Medical Association, 273*(17), 1333-1334.

Smith, A., Kendrick, A., & Maben, A. (1992). Use and effects of food and drinks in relation to daily rhythms of mood and cognitive performance. Effects of caffeine, lunch and alcohol on human performance, mood and cardiovascular function. The *Proceedings of the Nutrition Society, 51*(3), 325-333.

Smith, B. S., Jr. (1995). The effects of exposure to violent lyric music and consumption of alcohol on aggressiveness. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 56*(6-B), 3487.

Smith Erthal, F., De Oliveira, L., Mocaiber, I., Garcia Pereira, M., Machado Pinheiro, W., Volchan, E., et al. (2005). Load-dependent modulation of affective picture processing. *Cognitive, Affective and Behavioral Neuroscience, 5*(4), 388-395.

Soo Ampon, S., Wongwitdecha, N., Plasen, S., Hindmarch, I., & Boyle, J. (2004). Effects of word frequency on recall memory following lorazepam, alcohol, and lorazepam alcohol interaction in healthy volunteers. *Psychopharmacology, 176*(3-4), 420-425.

Soyka, M., Aichmuller, C., Preuss, U., & Moller, H. J. (1998). Effects of acamprosate on psychomotor performance and driving ability in abstinent alcoholics. *Pharmacopsychiatry, 31*(6), 232-235.

Spiga, R., Macenski, M. J., Meisch, R. A., & Roache, J. D. (1997). Human ethanol self-administration. I: The interaction between response requirement and ethanol dose. *Behavioral Pharmacology, 8*(1), 91-100.

Spilich, G. (1995). Smoking, alcohol, and neuromuscular function in older women. *The Journal of the American Medical Association, 273*(17), 1334.

Springer, E., Staak, M., & Raff, G. (1973). Experimentelle Untersuchungen zur Resorption geringer Alkoholmengen und ihre Auswirkungen auf die Verkehrstüchtigkeit. *Beiträge zur gerichtlichen Medizin, 31*, 253-258.

Stanovich, K. E., & West, R. F. (2007). Natural myside bias is independent of cognitive ability. *Thinking and Reasoning, 13*(3), 225-247.

Steele, C. M., Critchlow, B., & Liu, T. J. (1985). Alcohol and social behavior II: the helpful drunkard. *Journal of Personality and Social Psychology, 48*(1), 35-46.

Steele, C. M., & Josephs, R. A. (1990). Alcohol myopia: Its prized and dangerous effects. *American Psychologist, 45*(8), 921-933.

Stein, K. D., Goldman, M. S., & Del Boca, F. K. (2000). The influence of alcohol expectancy priming and mood manipulation on subsequent alcohol consumption. *Journal of Abnormal Psychology, 109*(1), 106-115.

Stewart, S. H., Finn, P. R., & Pihl, R. O. (1992). The effects of alcohol on the cardiovascular stress response in men at high risk for alcoholism: A dose response study. *Journal of Studies on Alcohol, 53*(5), 499-506.

Stewart, S. H., Finn, P. R., & Pihl, R. O. (1995). A dose-response study of the effects of alcohol on the perceptions of pain and discomfort due to electric shock in men at high familial-genetic risk for alcoholism. *Psychopharmacology, 119*(3), 261-267.

Stoller, K. P. (2005). Quantification of neurocognitive changes before, during, and after hyperbaric oxygen therapy in a case of fetal alcohol syndrome. *Pediatrics, 116*(4), e586-591.

Stormark, K. M., Field, N. P., Hugdahl, K., & Horowitz, M. (1997). Selective processing of visual alcohol cues in abstinent alcoholics: an approach-avoidance conflict? *Addictive Behavior, 22*(4), 509-519.

Strayer, D. L., Drews, F. A., & Crouch, D. J. (2006). A comparison of the cell phone driver and the drunk driver. *Human Factors, 48*(2), 381-391.

Streufert, S., Pogash, R., Braig, D., Gingrich, D., Kantner, A., Landis, R., et al. (1995). Alcohol hangover and managerial effectiveness. *Alcoholism: Clinical and Experimental Research, 19*(5), 1141-1146.

Sumarta, T. T. (2000). Effects of videos, words and beverage cues on subsequent consumption of beverages. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 61*(6-B), 3311.

Swift, R. M., Davidson, D., Whelihan, W., & Kuznetsov, O. (1996). Ondansetron alters human alcohol intoxication. *Biological Psychiatry, 40*(6), 514-521.

Swift, R. M., Whelihan, W., Kuznetsov, O., Buongiorno, G., & Hsuing, H. (1994). Naltrexone-induced alterations in human ethanol intoxication. *American Journal of Psychiatry, 151*(10), 1463-1467.

Talland, G. A. (1966). Effects of alcohol on performance in continuous attention tasks. *Psychosomatic Medicine, 28*(4), 596-604.

Taylor, R., & O'Carroll, R. (1995). Cognitive estimation in neurological disorders. *Journal of Clinical Psychology, 34*(Pt 2), 223-228.

Taylor, S. P. (1993). Experimental investigation of alcohol-induced aggression in humans. *Alcohol Health and Research World, 17*(2), 108-112.

Taylor, S. P., & Chermack, S. T. (1993). Alcohol, drugs and human physical aggression. *Journal of Studies on Alcohol, S11*, 78-88.

Teger, A. I., Katkin, E. S., & Pruitt, D. G. (1969). Effects of alcoholic beverages and their congener content on level and style of risk taking. *Journal of Personality and Social Psychology, 11*(2), 170-176.

Thomas, J. D., Leany, B. D., & Riley, E. P. (2003). Differential vulnerability to motor deficits in second replicate HAS and LAS rats following neonatal alcohol exposure. *Pharmacology, Biochemistry and Behavior, 75*(1), 17-24.

Tivis, L. J., Green, M. D., Nixon, S. J., & Tivis, R. D. (2003). Alcohol, estrogen replacement therapy, and visuospatial processes in postmenopausal women. *Alcoholism: Clinical and Experimental Research, 27*(7), 1055-1063.

Tossavainen, T., Juhola, M., Aalto, H., Toppila, E., Pyykko, I., Honkavaara, P., et al. (2001). Postural control as assessed with virtual reality. *Acta Oto Laryngologica, 121*(Suppl545), 53-56.

Totterdell, P., Reynolds, S., Parkinson, B., & Briner, R. B. (1994). Associations of sleep with everyday mood, minor symptoms and social interaction experience. *Sleep: Journal of Sleep Research and Sleep Medicine, 17*(5), 466-475.

Townshend, J. M., & Duka, T. (2005). Binge drinking, cognitive performance and mood in a population of young social drinkers. *Alcoholism: Clinical and Experimental Research, 29*(3), 317-325.

Tracy, J. I., & Bates, M. E. (1994). Models of functional organization as a method for detecting cognitive deficits: data from a sample of social drinkers. *Journal of Studies on Alcohol, 55*(6), 726-738.

Tucker, J. A., Maisto, S. A., Vuchinich, R. E., & Blumenthal, L. (1979). Alcohol and anxiety: The role of drinking context, expectancy, and sex of subject. *Behavioural Psychotherapy, 7*, 75-84.

Tucker, J. A., & Vuchinich, R. E. (1983). An information processing analysis of the effects of alcohol on perceptions of facial emotions. *Psychopharmacology (Berl), 79*(2-3), 215-219.

Uecker, A., & Nadel, L. (1996). Spatial locations gone awry: object and spatial memory deficits in children with fetal alcohol syndrome. *Neuropsychologia, 34*(3), 209-223.

Van, F., O'Boyle, D. J., & Hume, K. I. (1995). Effects of alcohol on the sleep-stage structure of a nap in the afternoon. *Biological Psychology, 41*(1), 55-59.

Van, F., O'Boyle, D. J., & Hume, K. I. (1996). "Effects of alcohol on the sleep-stage structure of a nap in the afternoon": Erratum. *Biological Psychology, 43*(1), 85.

van Thriel, C., Zupanic, M., Sietmann, B., Demes, P., Willer, H., & Seeber, A. (1998). Association of biochemical and subjective indicators of drinking habits with performance on different neurobehavioral tasks. *Neurotoxicology, 19*(4-5), 713-720.

Verfaellie, M., Cermak, L. S., Letourneau, L., & Zuffante, P. (1991). Repetition effects in a lexical decision task: the role of episodic memory in the performance of alcoholic Korsakoff patients. *Neuropsychologia, 29*(7), 641-657.

Verfaellie, M., Milberg, W. P., Cermak, L. S., & Letourneau, L. L. (1992). Priming of spatial configurations in alcoholic Korsakoff's amnesia. *Brain and Cognition, 18*(1), 34-45.

Vernon, P. A., Lee, D., Harris, J. A., & Jang, K. L. (1996). Genetic and environmental contributions to individual differences in alcohol expectancies. *Personality and Individual Differences, 21*(2), 183-187.

Vogel Sprott, M. (1997). Is behavioral tolerance learned? *Alcohol Health and Research World, 21*(2), 161-168.

Vogel Sprott, M., Easdon, C., Fillmore, M., Finn, P., & Justus, A. (2001). Alcohol and behavioral control: Cognitive and neural mechanisms. *Alcoholism: Clinical and Experimental Research, 25*(1), 117-121.

Vogel Sprott, M., & Fillmore, M. T. (1993). Impairment and recovery under repeated doses of alcohol: effects of response-outcomes. *Pharmacology Biochemistry and Behavior, 45*(1), 59-63.

Vuchinich, R. E., Tucker, J. A., & Sobell, M. B. (1979). Alcohol, Expectancy, Cognitive labeling, and mirth. *Journal of Abnormal Psychology,, 88*(6), 641-651.

Wallace, M. J., Newton, P. M., Oyasu, M., McMahon, T., Chou, W. H., Connolly, J., et al. (2007). Acute functional tolerance to ethanol mediated by protein kinase Cepsilon. *Neuropsychopharmacology, 32*(1), 127-136.

Walsh, D. C., Hingson, R. W., Merrigan, D. M., Cupples, L. A., Levenson, S. M., & Coffman, G. A. (1991). Associations between alcohol and cocaine use in a sample of problem-drinking employees. *Journal of Studies on Alcohol, 52*(1), 17-25.

Wansink, B., & van Ittersum, K. (2005). Shape of glass and amount of alcohol poured: comparative study of effect of practice and concentration. *British Medical Journal, 331*, 1512-1514.

Ward, C. L., Lombard, C. J., & Gwebushe, N. (2006). Critical incident exposure in South African emergency services personnel: prevalence and associated mental health issues. *Emergency Medicine Journal, 23*(3), 226-231.

Wass, T. S., Simmons, R. W., Thomas, J. D., & Riley, E. P. (2002). Timing accuracy and variability in children with prenatal exposure to alcohol. *Alcoholism: Clinical and Experimental Research, 26*(12), 1887-1896.

Weaver, J. B., Masland, J. L., Kharazmi, S., & Zillmann, D. (1985). Effect of alcoholic intoxication on the appreciation of different types of humor. *Journal of Personality and Social Psychology, 49*(3), 781-787.

Weinberger, A. H., Darkes, J., Del Boca, F. K., Greenbaum, P. E., & Goldman, M. S. (2006). Items as context: Effects of item order and ambiguity on factor structure. *Basic and Applied Social Psychology, 28*(1), 17-26.

Welch, L. W., Cunningham, A. T., Eckardt, M. J., & Martin, P. R. (1997). Fine motor speed deficits in alcoholic Korsakoff's syndrome. *Alcoholism: Clinical and Experimental Research, 21*(1), 134-139.

Welch, L. W., Nimmerrichter, A., Gilliland, R., King, D. E., & Martin, P. R. (1997). "Wineglass" confabulations among brain-damaged alcoholics on the Wechsler Memory Scale-Revised visual reproduction subtest. *Cortex, 33*(3), 543-551.

Welch, R. B., et al. (1977). The effect of alcoholic intoxication upon calorically induced oculogyral illusion. *Perception and Psychophysics, 21*(4), 352-356.

Wells, S., & Graham, K. (2003). Aggression involving alcohol: Relationship to drinking patterns and social context. *Addiction, 98*(1), 33-42.

Wells, S., Graham, K., & West, P. (2000). Alcohol-related aggression in the general population. *Journal of Studies on Alcohol, 61*(4), 626-632.

Wesnes, K., McEwen, J., & Pritchard, G. (1994). The dose and time dependent profile of cognitive impairments of alcohol in young volunteers. *Journal of Clinical Pharmacology, 34*, 1021.

Wesnes, K. A., Lockton, A., Rolan, P., Stephenson, N., & Pincock, C. (1997). Volunteer study of the potential interaction between remacemide 300 mg and alcohol (0.7 g/kg). *Journal of Psychopharmacology, S11*, A59.

Whitfield, J. B., & Martin, N. G. (1996). Alcohol reactions in subjects of European descent: effects on alcohol use and on physical and psychomotor responses to alcohol. *Alcoholism: Clinical and Experimental Research, 20*(1), 81-86.

Wiegersma, S., de Jong, E., & van Dieren, M. (1991). Subjective ordering and working memory in alcoholic Korsakoff patients. *J Clin Exp Neuropsychol Journal of Clinical and Experimental Neuropsychology, 13*(6), 847-853.

Wiers, R. W., Stacy, A. W., Ames, S. L., Noll, J. A., Sayette, M. A., Zack, M., et al. (2002). Implicit and explicit alcohol-related cognitions. *Alcoholism: Clinical and Experimental Research, 26*(1), 129-137.

Wiers, R. W., Van Woerden, N., Smulders, F. T. Y., & De Jong, P. J. (2002). Implicit and explicit alcohol-related cognitions in heavy and light drinkers. *Journal of Abnormal Psychology, 111*(4), 648-658.

Wilcox, C., & al., e. (1996). A double blind, eight way crossover comparison of Abercarnil, lorazepam and placebo alone and after a single dose of alcohol, on psychometric performance in healthy volunteers. *Psychopharmacology Bulletin, 32*, 536.

Willford, J. A., Richardson, G. A., Leech, S. L., & Day, N. L. (2004). Verbal and visuospatial learning and memory function in children with moderate prenatal alcohol exposure. *Alcoholism: Clinical and Experimental Research, 28*(3), 497-507.

Williamson, A. M., & Feyer, A. M. (2000). Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication. *Occupational and Environmental Medicine, 57*(10), 649-655.

Willner, P., Field, M., Pitts, K., & Reeve, G. (1998). Mood, cue and gender influences on motivation, craving and liking for alcohol in recreational drinkers. *Behavioural Pharmacology, 9*(7), 631-642.

Wilson, G., & Mitchell, R. (1983). The effect of alcohol on the visual and ocular motor systems. *Australian Journal of Ophthalmology, 11*(4), 315-319.

Wilson, G. T., & Abrams, D. (1977). Effects of alcohol on social anxiety and physiological arousal: Cognitive versus pharmacological processes. *Cognitive Therapy and Research, 1*(3), 195-210.

Wilson, G. T., & Lawson, D. M. (1976). Expectancies, alcohol, and sexual arousal in male social drinkers. *Journal of Abnormal Psychology, 85*(6), 587-594.

Wilson, G. T., & Lawson, D. M. (1978). Expectancies, alcohol, and sexual arousal in women. *Journal of Abnormal Psychology, 87*(3), 358-367.

Wilson, G. T., & Niaura, R. (1984). Alcohol and the disinhibition of sexual responsiveness. *Journal of Studies on Alcohol, 45*(3), 219-224.

Wilson, G. T., Niaura, R. S., & Adler, J. L. (1985). Alcohol, selective attention and sexual arousal in men. *Journal of Studies on Alcohol, 46*(2), 107-115.

Wixted, J. T. (2005). A theory about why we forget what we once knew. *Current Directions in Psychological Science, 14*(1), 6-9.

Wojahn, H., & Glass, F. (1967). Aufmerksamkeitsstörungen im psycho technischen Versuch (BOURDON Test) bei Blutalkoholkonzentrationen von 0,21 bis 0,95 o/oo. *Blutalkohol, 6*, 303-312.

Wozniak, D. F., Cicero, T. J., Kettinger, L., 3rd, & Meyer, E. R. (1991). Paternal alcohol consumption in the rat impairs spatial learning performance in male offspring. *Psychopharmacology, 105*(2), 289-302.

Yasenchak, J. (1997). The relation between perceived self-efficacy and perceived family environment in problem drinkers. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 57*(8-a), 3407.

Yerka, E. C. (2000). The role of alcohol expectancies, locus of control, and desirability of control in the prediction of abstinence three months post-inpatient treatment for alcohol dependence. *Dissertation Abstracts International: Section B: The Sciences and Engineering, 60*(11-B), 5807.

Yesavage, J. A., Taylor, J., Morrow, D., & Tinklenberg, J. (1992). The effects of alcohol on the variability of aircraft pilot performance. *Alcohol, Drugs and Driving, 8*(3-4), 217-224.

Yildirim, Y., Niemi, L., Wong, G., Korpi, E. R., & Rosenberg, P. H. (1997). Propofol-induced ataxia and hypnosis in rat lines selected for differential alcohol sensitivity. *Pharmacology and Toxicology, 80*(1), 44-48.

Yonker, J. E., Nilsson, L. G., Herlitz, A., & Anthenelli, R. M. (2005a). Sex Differences in Spatial Visualization and Episodic Memory as a Function of Alcohol Consumption. *Alcohol and Alcoholism, 40*(3), 201-207.

Yonker, J. E., Nilsson, L. G., Herlitz, A., & Anthenelli, R. M. (2005b). Sex differences in spatial visualization and episodic memory as a function of alcohol consumption. *Alcohol and Alcoholism, 40*(3), 201-207.

Zacchia, C., Pihl, R. O., Young, S. N., & Ervin, F. R. (1991). Effect of sucrose consumption on alcohol-induced impairment in male social drinkers. *Psychopharmacology, 105*(1), 49-56.