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Themenübersicht

1. Pflanze des Jahres: *Thymus vulgaris*
2. Anti-Krebs
3. TTO
4. Varia
5. Alzheimer
6. Lavendelöl, Linalool,
7. Zusammenfassung, Conclusion

- **Thymol** (*Th.vulgaris*, Lamiaceae)

- Positiv allosteric modulator of human GABA_A receptor (GABA neurotransmitter, action of GABA by ionotropic receptors = pentameric transmembrane proteins, GABA-gated anion channel), e.g. Cl⁻
- stimulates agonist actions of pentobarbital, propofol, typical for allosteric modulation = anxiolysis, cessation of convulsions, sedation, general anaesthesia
- potentiation GABA_A receptor at a previously unidentified binding site
- besides strong antimicrobial (= bactericidal) activities, antioxidant properties

(C.M. Priestley et al. 2003)

Perillyl Alcohol

Metabolisierungsprodukt von Limonen,
dem Hauptbestandteil des süßen Orangenöls

- beschleunigt die Apoptose der Tumor Zellen:
 - 6x rascher als in unbehandelten Zellen
 - auch durch 2 – 8-fache Zunahme eines bestimmten „pro-apoptotischen“ Proteins
- Gewicht der tumorösen Leber : 10-fach geringer in behandelten Tieren

(Stayrook et al. 1997)

(Mills et al. 1995)

Geraniol

- 50 %ige längere Überlebenszeit mit Geraniol Diät
- Sogar 20 % der Tiere ohne Tumor, wenn 14 Tage vorher mit Geraniol-Diät begonnen wurde

• *(Wattenberg 1991), (Yu et al. 1995),
(Shoff et al. 1991)*

- **EO of [Citrus aurantiifolia (Christm.) Swingle]**

- Lime oil (Limonelle, saure Limette)
- antiproliferative activity against colon carcinoma cells, cultured human adenocarcinoma cells
- EO: dose dependent inhibition of viability at different concentrations
- MTT-assay, LDH (lactate dehydrogenase) released from cells due to damage in cell membrane → cell death by necrosis or apoptosis
- DNA-fragmentation ↑, caspase-3-activity to induce apoptosis ↑

(J.R.Patil et al., 2009)

Tea Tree Oil

- *Melaleuca alternifolia* (Myrtaceae)
- Terpeneol-type:
 - 32 – 45 % terpinen-4-ol
- Cineol-type:
 - Up to 60 % 1,8-cineol
- Terpinen-4-ol:
 - alone more effective in antibacterial time-kill assays

(Cox et al. 2001)

- **Limonene and EO from *Citrus aurantium* on gastric mucosa**

- Chemically induced ulcers in rats, healing activity of orange-EO
- 250 mg/kg EO, 245 mg/kg (+)-limonene: healing rate: EO 44%, (+)-limonene: 56%
- both promotion of an ↑ in epithelial healing (confirmed by immunohistochemistry)
- gastric mucus ↑ = gastric protective barrier ↑
- protection against lesions (e.g. EtOH, NSAID) = 99%
(T.M. Moraes et al., 2009 and 2012/2013)

- **Alzheimer Disease (AD)**

- age-associated neurodegenerative disorder, loss of memory & cognition & spatial memory by loss of forebrain cholinergic neurons, drastic ↓ of ACH, nicotinic ACH receptors density in cerebral cortex & hippocampus involved in learning & memory processes
- AD-patients: anxiety, depression, related to duration of dementia & severity of dementia
- (J.M. Garcia-Alberca et al., 2011)
- *L.angustifolia*: EO mixture more potent than individual components alone
- (B.F. Bradley et al., 2007)

Lavender Oil

- Placebo controlled study, Aroma stream, against severe dementia
- Alzheimer-Patients, patients suffering from vascular dementia
- medium to strong agitation according to PAS
60 % of the patients: Modest efficacy, sedation and calming
(Holmes et al. 2002)

Lavender aromatherapy hand massage: effective on emotions and aggressive behavior *(Lee, 2005)*

Lavender oil: inflammation, depression, stress, headache, chronic pain, cognitive disorders, anxiety, insomnia, facilitates memory formation, increase mood scores
(compiled, L. Hritcu et al., 2012)

Lavender essential oil and anxiolytic-like effect

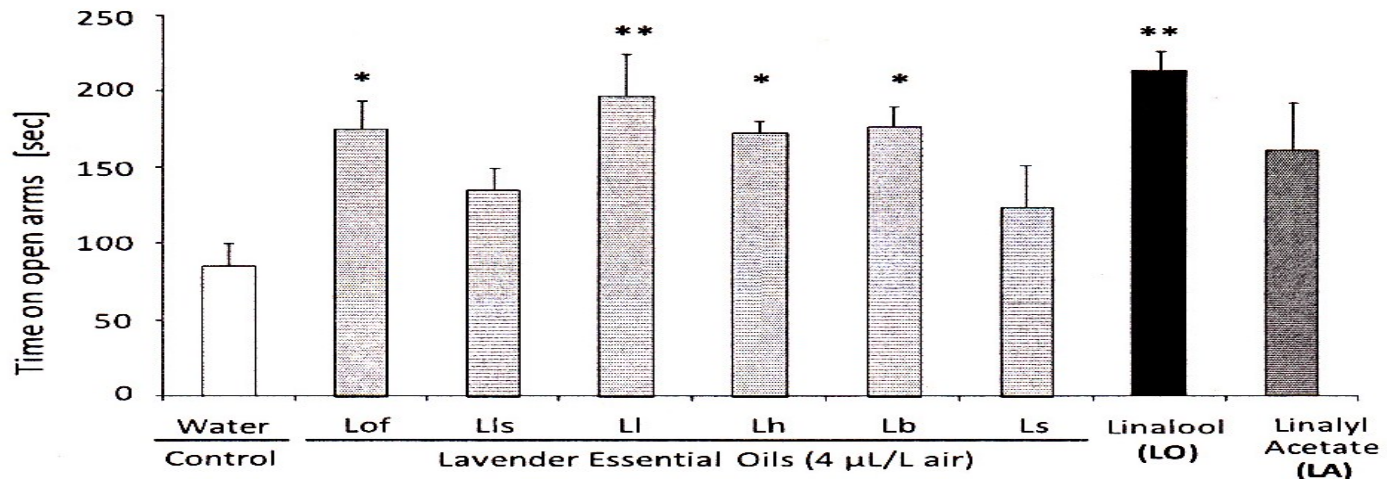
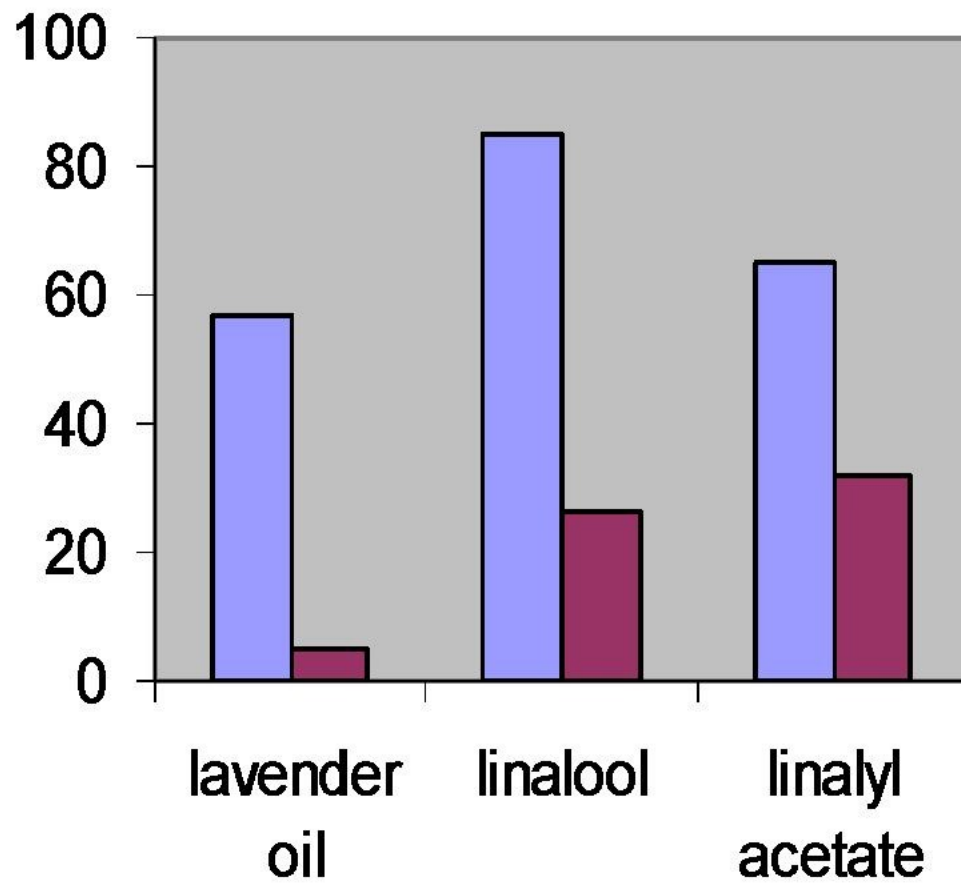


Figure 1: Time spent on open arms in elevated-plus maze (EPM) test after inhalation of essential oils obtained from 6 different species of *Lavandula*. All values represent means \pm S.E. ($n = 5$). * $P < 0.05$, ** $P < 0.01$. (Lof: *Lavandula officinalis*; Lis: *L. latifolia spica*; LI: *L. latifolia*; Lh: *L. hybrida*; Lb: *L. burnatii super acetate*; Ls: *L. stoechas*).

- anti-anxiety effect: LO : ++, LA: Ø
- LO + LA: ++, synergistic effect, „quiet reserve“
- LA \rightarrow LO + AcOOH
- Lis, Ls: kein LA

decrease of motor activity [%]
after 60 min



pure fragrance
caffeine +
fragrance

Chirality, Linalool and Physiological Parameters of Stress

24 human subjects, psychosocial stress, salivary cortisol levels

R-(-)-Linalool: influences GABA-mediated neuronal inhibition and potential effects GABA liberation and re-uptake, ↓ norepinephrine and dopamine levels, due to accelerated turnover of catecholamines in the CNS, also ↓ of ACTH levels.

Stress: ACTH and cortisol: ↑

linalool odor: stress relieving, determined by ↓-HR, ↓-BP and ↓- cortisol

(Höferl et al.,

- **EUAB (European Pharmacopoeia)**
- 7th edition, 2011, Grundwerk, p 1781-82

Lavendelöl (Essential Oil of Lavender)

- | | | |
|------------------|---------|--------|
| • Linalool: | 20-45% | 25-38% |
| • Linalylacetat: | 25-47% | 25-45% |
| • 1,8-Cineol: | < 2,5 % | 0-1,5% |
| • Campher: | < 1,2 % | 0-0,5% |

- *L. angustifolia* MILL.
- ISO 3515 (1987)

- **Lavender oil**

- 150 patients, pre-operative anxiety, before operating room, visual analog scale, control group, aroma group: significant ↓

- *Braden et al. 2009*

- **Lavender lamp**

- 50 subjects before gastroscopy, optimal soothing environment, visual scale, systolic RR ↓

- *Hoya et al. 2008*

- **Lavender scent**

- 340 dental patients, anxiety scales ↓

- *Kritsidina et al. 2010*

- *Lavandula angustifolia* MILLER ...

- Plant location: VISEU, Portugal

- Linalool 46,5 %
- **Camphor** 10,5 %
- **1,8-Cineole** 9,0 %
- Terpinen-4-ol 7,6 %
- Borneol 4,5 %
- *E*- β -Ocimene 4,2 %
- Lavandulyl acetate 3,0 %

- (R.Videira 2012/2013, in press)

- *Lavandula angustifolia ssp.angustifolia* MILL.

- (F) ~ 122 €/Kg
- (BG) ~ 144 „-“
- (RC) ~ 100 „-“
- BIO – *L. angustifolia* ~ 235 „-“
- (R)-(-)-Linalool ~ 60 „-“
- rac. Linalool ~ 8 „-“

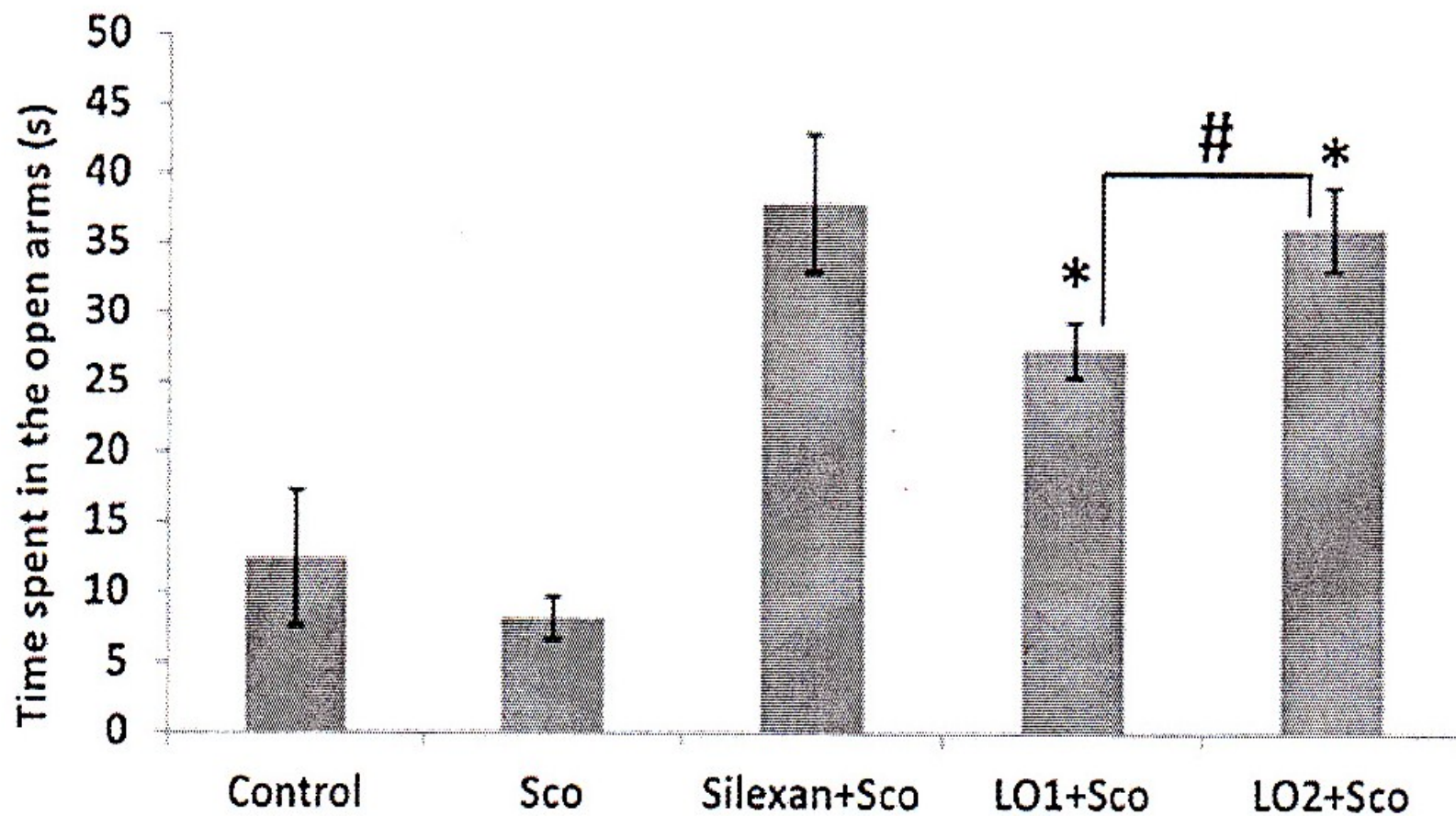


Fig. 2. Anxiolytic effects of the *Lavandula angustifolia* (LO1) and *Lavandula hybrida* (LO2) essential oils expressed by time spent in the open arms (s), in the elevated plus-maze in rats. Values are means \pm S.E.M. ($n = 10$ animals per group), * $p < 0.0001$ vs. Control group. For post hoc analyses - #LO1 + Sco vs. LO2 + Sco: $p < 0.0001$.

- Aromatherapy massages → relief anxiety in cancer patients
- **Bergamot oil** (*Citrus bergamia*, Rutaceae)
breast cancer patients: anxiety scales ↓,
immunological state ↑
(Imanishi et al. 2009)
- hospice patients, terminal cancer
(Chang 2008)

Qualität

- 1) Verfälschung, bzw. Streckung (vor allem bei teuren Äther. Ölen, um z.B. Normen des AB zu erfüllen), Pestizidbelastung (z.B. auch bei Biobauern bis zu 50 km im Umkreis, Lindan, HCCH, DDT), keine Lösungsmittlextraktion (also bei Äther. Ölen nur nach ISO 9235), höchste Reinheit bei Einzelduftstoffen (Preis!)
- 2) Fehlerquellen: Herstellung (z.B. Extraktion), Zusätze (Verfälschungen), Weiterverarbeitung (Luft, UV), Handhabung (Lagerung, Alter, UV, Sauerstoff, Wärme, Feuchtigkeit), z.B. bei „rinse off“ mehr als 0,01% oder bei „leave on“ mehr als 0,001% bei Duftstoffen des „26er-Mix“
- 3) Anwender: kann sich nur auf Anbauer, Hersteller, Vertreiber verlassen

EEG

- α -waves, β -waves, δ -waves and θ -waves
- α -wave dominance = relaxed state
- β -wave activity increase = contrary
- Lavender oil, sandalwood oil, apple aroma: ↓
- Jasmine odor: ↑
- *(Lorig et al. 1998)*
(van Toller et al. 1993) (Kobal et al. 1988) (Sugano 1989)

- **Rose oil:** trans-dermal absorption, breathing mask, 40 healthy students, ANS parameters, rating scales
- significant relaxant effect

(Hongratanaworakit 2009)

- **lavender oil, vetiver oil, vanillin**
Influence of odorants on respiration during sleep, 36 subjects one night, olfactometer, sleep depth ↑

(Arzi et al. 2010)

Terpinen-4-ol

- Mice
- anticonvulsant activity, up to 120 min after administration
- dose-dependent increase in duration of sleep
- CNS: ↓
- pretreatment: increase of latency of pentylenetetrazol convulsions, inhibition of picrotoxin seizures
- (D.P. de Souza et al. 2009)

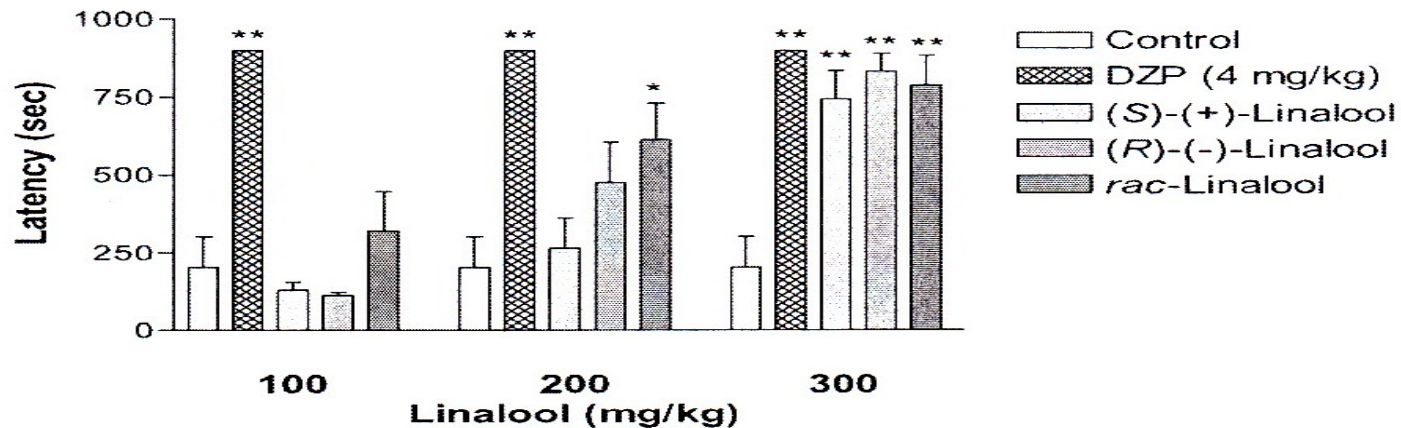


Figure 1: Effects of (*S*)-(+)-, (*R*)-(-)- and *rac*-linalool on PTZ-induced seizure in mice. Values are the latency of convulsions. Values are presented as mean \pm S.E.M. for 8 mice; * $p < 0.05$, ** $p < 0.01$, when compared with vehicle (control), one-way ANOVA, followed by Tukey's test.

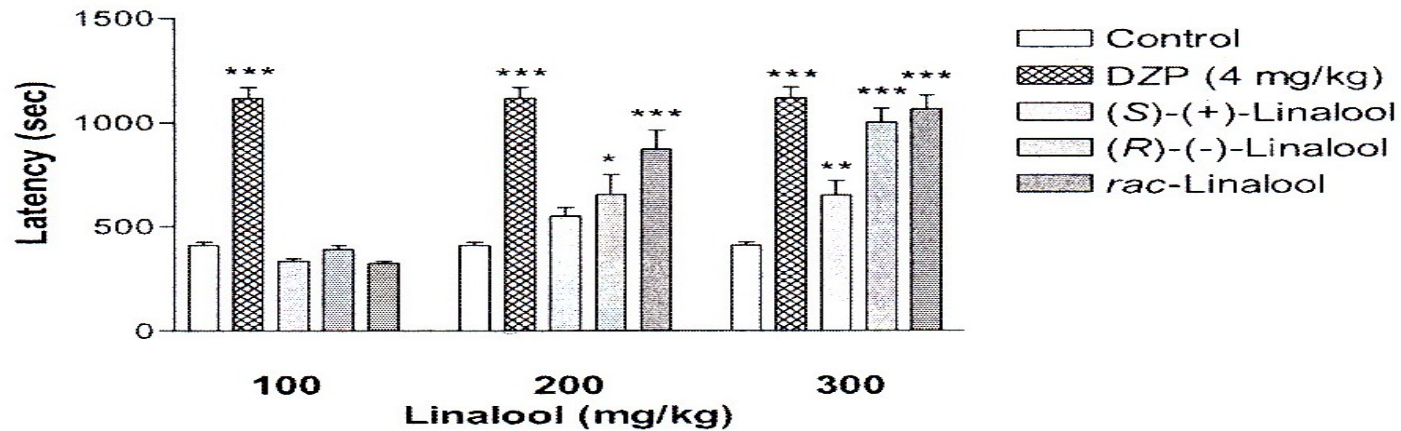


Figure 2: Effects of (*S*)-(+)-, (*R*)-(-)- and *rac*-linalool on PIC-induced seizure in mice. Values are the latency of convulsions. Values are presented as mean \pm S.E.M. for 8 mice; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, when compared with vehicle (control), one-way ANOVA, followed by Tukey's test.

Anti-inflammatory activities

Linalool, linalyl acetate: anti-inflammatory properties against carrageenin induced edema in rats . R-(-)-linalool: 25 mg/kg: delayed and prolonged effect, significant reduction 3h and 5h after carrageenine administration, 1h:∅ effect. Racemate: 1h: significant effect, higher doses than 25mg/kg: no increased effect, 3h and 5h: again significant effect with higher doses.

Equimolar linalyl acetate: less relevant, more delayed → = typical pro-drug behavior (after 3h and 5h at higher doses: significant).

(Peana et al., 2002)

Anti-Krebs Wirkungen

- Limonene
- Perillyl alcohol
 - National Cancer Institute
 - Clinical phase II
 - Chemo-preventative, chemo-therapeutic agent
 - Pharmacokinetic study using stable isotope labelled internal standards

(Phillips et al. 1995)

Against lung tumor, pancreatic tumor

Alzheimer

AD: Form einer neurodegenerativen Krankheit,
= Schädigung kognitiver Funktionen,
progressiver Verlust der Erinnerung,
Erregung, Unruhe, aggressives Verhalten,
Demenz

Symptomatische Behandlung mit Acetyl-Cholin-
Esterase-Hemmer

Lavendelöl, Melissenöl: Agitation ↓, Zeit die
Patienten in konstruktiven Aktivitäten
eingebunden sind ↑, Zeit der sozialen
Zurückgezogenheit ↓ *(Elliott et al.2007)*