

Contents

Abstract 6

Kurzfassung 7

1. Introduction 8

2. Theoretical Background 10

2.1. Physiological Structure underlying NIF-Effects 10

2.2. Quantifying Light 11

2.3. Attention Theory 14

2.3.1. Intensity Function 15

2.3.2. Selectivity Function 15

2.3.3. Quantification of Attention 16

2.4. Link of Light Exposure to Brain Mechanisms - How do ipRGCs mediate NIF Effects? 17

3. Alerting Effects of Light - Current State of Research 19

4. Laboratory Study - Fulltime Daytime Workers 30

4.1. Research Hypotheses 30

4.2. Methodology 32

4.2.1. Independent Variables 32

4.2.2. Dependent Variables 33

4.2.3. Covariables 37

4.2.4. Protocol 39

4.3. Results 50

4.3.1. Light Exposure during Laboratory Experiments 50

4.3.2. Results of Test Phases 52

4.3.3. Results of Work Phases 66

4.3.4. Room and Lighting Questionnaire 67

4.4. Discussion 70

4.4.1. Light Exposure 70

4.4.2. Effect of Lighting on Correlates of Attention 70

4.4.3. Effect of Lighting on Mood and Experience of the Room 71

4.4.4. Effects of lighting in the context of a supportive workplace 71

4.4.5. Effects of Time on Correlates of Attention 74

4.4.6. Effects of Covariables on Correlates of Attention 75

4.4.7. Limitations 76

5. Field Study - Home-based Workers 79

5.1. Research Hypotheses 79

5.2. Methodology 80

5.2.1. Independent Variables 80

5.2.2. Dependent Variables 80

5.2.3. Covariables 80

5.2.4. Protocol 81

5.3. Results 84

5.3.1. Light Exposure on Home-based Workdays 84

5.3.2. Satisfaction with the additional Lighting	90
5.3.3. Subjective Scales	91
5.3.4. Psychomotor Vigilance Task	92
5.4. Discussion	93
5.4.1. Limitations	93
5.4.2. Light Exposure	94
5.4.3. Subjective Scales	96
5.4.4. Psychomotor Vigilance Task	96
5.4.5. Summary	96

6. Conclusion & Outlook 98

References 100

Abbreviations 110

A. Appendix 112

A.1. Analysis of Parameters in Test Phases	112
A.1.1. PVT	112
A.1.2. 2Back / Go-/NoGo-Task (GNG-Task)	120
A.1.3. GNG-Task	130
A.1.4. Subjective Scales	140
A.1.5. Satisfaction with Lighting	157
A.2. Results of Work Phases	165
A.3. Lighting	184
A.4. Temperature and Carbon Dioxide Concentration	188
A.5. Light Exposure on Days before Session Days	193
A.6. Subjective Scales in Test Phases	194
A.7. Light-satisfaction-survey of Field Study	196