

Through the eyes of the teacher

Mandy Klatt¹, Dr. Gregor Kachel^{1, 2}, Dr. Christin Lotz¹, & Prof. Dr. Anne Deiglmayr¹

¹ Leipzig University

² Max-Planck University for Evolutionary Anthropology

Author Note

The Ethics Advisory Board of Leipzig University has dealt with the research project and has come to the conclusion that there are no objections to the implementation of this research project. The Ethics Advisory Board points out that the scientific and ethical responsibility for the implementation of the project remains with the project director.

Correspondence concerning this article should be addressed to Mandy Klatt,
Egelstraße 2a 04103 Leipzig. E-mail: mandy.klatt@uni-leipzig.de

Abstract

This document is a supplement to the paper and shows first graphs findings from the pilot study.

Keywords: Professional Vision, Expert-Novice-Paradigm, Eye-Tracking

Word count: 1949

Through the eyes of the teacher

State of research

Teaching and classroom management are multidimensional settings in which teachers have to respond immediately to events as they develop (Barnes, 2004). The different interests and abilities of students must be managed in a way that maximizes the active learning time of students and minimizes disruptions whilst teaching. Learning to develop such classroom management skills and to teach effectively is a complicated and complex process (Wolff, Jarodzka, & Boshuizen, 2017).

During teaching, teachers must be able to select from a variety of visual and acoustic impressions to focus their attention on the essential and to distinguish between relevant and irrelevant events. This ability is called professional vision and is a key component of teacher expertise and successful teaching (Barth, 2017). Eye tracking technology has become a reliable means to study teachers' visual focus of attention (Bogert, 2016; Pouta, Lehtinen, & Palonen, 2020; Wolff, Jarodzka, & Boshuizen, 2017)

Educational research has repeatedly shown that there are differences between experienced and novice teachers in terms of perception and behavioral competencies (Barth, 2017; Bogert, 2016; Wolff, Jarodzka, & Boshuizen, 2017). For example, experts direct their attention more often and more evenly to all students, whereas novices only direct their attention to some students. The frequency and duration of fixations as eye movement are decisive (Stuermer, Seidel, Mueller, Häusler, & Cortina, 2017). Mobile eye-tracking technology has also shown that experienced teachers distribute their focus more efficiently to solve tasks (Jarodzka, Scheiter, Gerjets, & Van Gog, 2010). Furthermore, in contrast to novices, experts are able to focus their attention on the entire class and guide the class while giving feedback to individual students and answering questions (Cortina, Miller, McKenzie, & Epstein, 2015).

Research questions

The aim of the pilot study was to investigate whether there are differences in how expert and novice teachers manage scripted classroom disruptions. The disruptions were experimentally varied using a previously written script. Thus, our aim was to find out whether differences in the allocation of attention between expertise groups can be detected in this controlled context.

In order to answer this question, the hypothesis was formulated that teachers with more professional experience not only notice more disruptions but also notice them faster. In the hypothesis, therefore, it is necessary to check what has already been shown in the research literature: In complex teaching situations, experts have a more structured and elaborate professional knowledge than novices in order to perceive and interpret relevant events and to act appropriately (Berliner, 2001; Lachner, Jarodzka, & Nückles, 2016).

Methods

We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study.

Participants

For the sample recruitment of the subjects ($N = 8$, experts $n = 2$, novices $n = 6$), schools in the city of Leipzig in Saxony were contacted. The institutions as well as the subjects were informed in detail about the aim and intention of the study in advance. Participation in the study was voluntary and only took place after written consent has been given.

The selection of the subjects was based on extreme groups, whereby professional experience is the crucial criterion for the selection of experts or novices. Novices were recruited as teachers who have been working in the teaching profession for no more than 3

Table 1

Demographic Information and Teaching Experience

group	N	Male	M age	Min age	Max age	SD age	M exp.	Min exp.	Max exp.	SD exp.
expert	2	1	47.50	44	51	4.95	20.00	15.00	25.00	7.07
novice	6	2	25.67	20	33	4.89	0.68	0.00	1.50	0.68

years, whereas experts were considered to have professional experience of 10 years or more (Messner & Reusser, 2000).

Procedure/ Data collection

Set up. For this study, scripted mini-lessons with $n = 2$ experts and $n = 6$ novices were recorded in the mobile Lab of the Empirical School and Classroom Research at the University of Leipzig. The subjects were divided into groups of four, so the study was conducted on two different sessions. All participants were asked to hold a 10-minute lesson. The duration of each appointment was approximately 2h: per group 10min briefing, 4 x 10min mini-lessons, 10min technical preparation and follow-up and 4x 10min transition points between the lessons and answering questionnaires.

One person from the group of 4 acted as a teacher, the other three subjects acted as the class. The subjects, who represented the class, were given behavioral instructions in a pre-written script to simulate typical events and disruptions in the classroom (e.g. putting their heads on the table, chatting, looking at their mobile phones, etc.).

The lesson disruptions were displayed as instructions during the lesson for all “students” but not the teacher. In order to avoid learning effects, the disruptions in each lesson were distributed pseudo-randomly over the short teaching phase. In addition, the order of the data collection was taken into account in the analyses and variance caused by

84 order was controlled.



Figure 1. Example for set up during a mini-lesson

85 **Questionnaire data.** After each mini-lesson, the students answered items on the
86 teaching quality using a validated questionnaire (Helmke et al., 2014) and scales on the
87 teacher's presence behavior (students $n = 24$). In addition, the teacher was asked to give a
88 self-assessment on his/her classroom management by completing the questionnaire after
89 each mini-lesson (teachers $n = 8$).

90 **Coding/ Data preparation/ Reliability**

91 **Questionnaire Data.** The evaluation after each mini-lesson was conducted using
92 paper questionnaires. Time needed to complete the questionnaire was about 5 minutes.
93 The scales on the quality of teaching are a validated questionnaire (Helmke et al., 2014).
94 Whereas the scales on the teacher's presence behavior were derived from the research
95 literature (Brophy, 1986; Kiel, Frey, Weiß, & Weiss, 2013; Kounin, 2006; Marzano, 2007;

Nolting, 2012) and were used in the pilot for the first time. The questionnaire is 4-point Likert scale (1 = Strongly Disagree; 2 = Disagree; 3 = Agree; 4 = Strongly Agree). Data was obtained from $N = 32$ subjects (students $n = 24$, teachers $n = 8$).

The following scales were assessed:

- (1) Classroom management
- (2) Positive climate and motivation
- (3) Clarity and structuredness
- (4) Activation and support
- (5) Presence: posture/gaze
- (6) Presence: voice
- (7) Presence: verbal and non-verbal intervention
- (8) Natural behaviour

Table 2 provides an overview over the mean, the standard deviation, the range, Cronbach's Alpha and the Skewness & Kurtosis of all scales for the teachers' self-assessment.

```
## Some items ( ks_sichtbar ) were negatively correlated with the total scale and
## probably should be reversed.
## To do this, run the function again with the 'check.keys=TRUE' option

## Some items ( pi_nonverbal ) were negatively correlated with the total scale and
## probably should be reversed.
## To do this, run the function again with the 'check.keys=TRUE' option

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## probably should be reversed.
## To do this, run the function again with the 'check.keys=TRUE' option
```

Table 2

Scale analysis for teachers' self-assessment

scale	N items	M	SD	Min	Max	Skewness	Kurtosis	Cronbach's a
Activation and support	3	2.46	1.14	1	4	0.10	1.65	0.85
Clarity and structuredness	2	2.81	0.91	1	4	-0.17	2.17	-0.76
Classroom management	4	2.44	0.88	1	4	0.19	2.38	0.83
Natural behaviour	3	2.83	0.76	2	4	0.28	1.84	0.90
Positive climate and motivation	6	2.85	0.87	1	4	-0.49	2.65	0.78
Presence: posture/gaze	7	2.70	1.01	1	4	-0.44	2.15	0.85
Presence: verbal and non-verbal intervention	3	2.75	0.79	1	4	-0.07	2.48	-0.75
Presence: voice	3	2.79	0.72	2	4	0.32	2.03	0.77

Table 3 provides an overview over the mean, the standard deviation, the range, Cronbach's Alpha and the Skewness & Kurtosis of all scales for the students' perception of the teacher's behaviour in class.

Some items (phb_stand) were negatively correlated with the total scale and
probably should be reversed.
To do this, run the function again with the 'check.keys=TRUE' option

Some items (pi_direkt) were negatively correlated with the total scale and
probably should be reversed.
To do this, run the function again with the 'check.keys=TRUE' option

Some items (phb_stand) were negatively correlated with the total scale and
probably should be reversed.
To do this, run the function again with the 'check.keys=TRUE' option

Table 3

Scale analysis for students' perspective

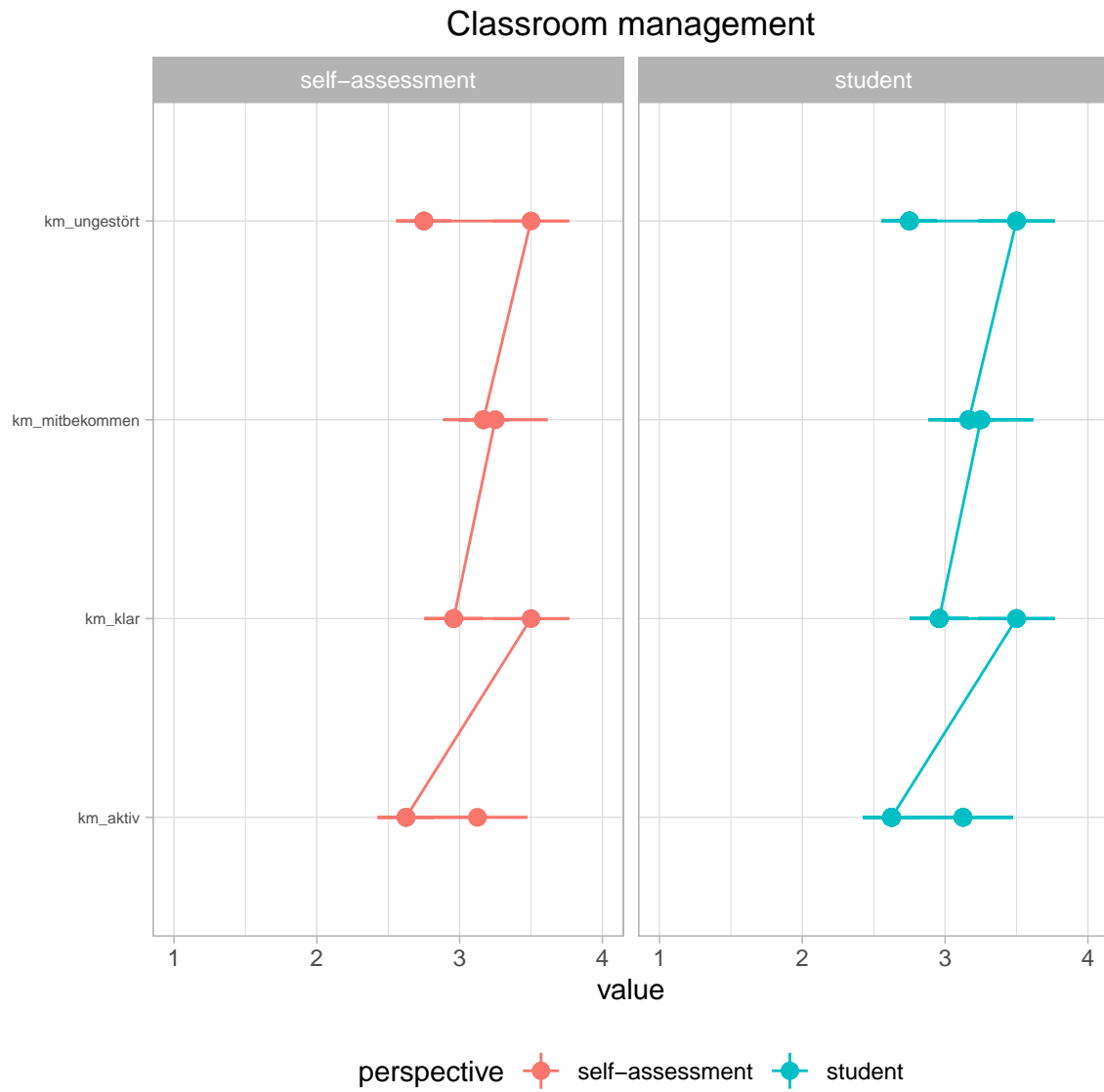
scale	N items	M	SD	Min	Max	Skewness	Kurtosis	Cronbach's α
Activation and support	3	2.64	1.13	1	4	-0.32	1.73	0.48
Clarity and structuredness	2	3.58	0.68	1	4	-1.75	6.09	0.62
Classroom management	4	3.18	0.91	1	4	-0.87	2.86	0.75
Natural behaviour	3	3.43	0.67	2	4	-0.74	2.46	0.85
Positive climate and motivation	6	3.41	0.83	1	4	-1.40	4.29	0.82
Presence: posture/gaze	7	3.24	0.89	1	4	-1.05	3.31	0.59
Presence: verbal and non-verbal intervention	3	3.18	0.81	1	4	-0.66	2.70	0.20
Presence: voice	3	3.60	0.60	2	4	-1.18	3.36	0.71

132

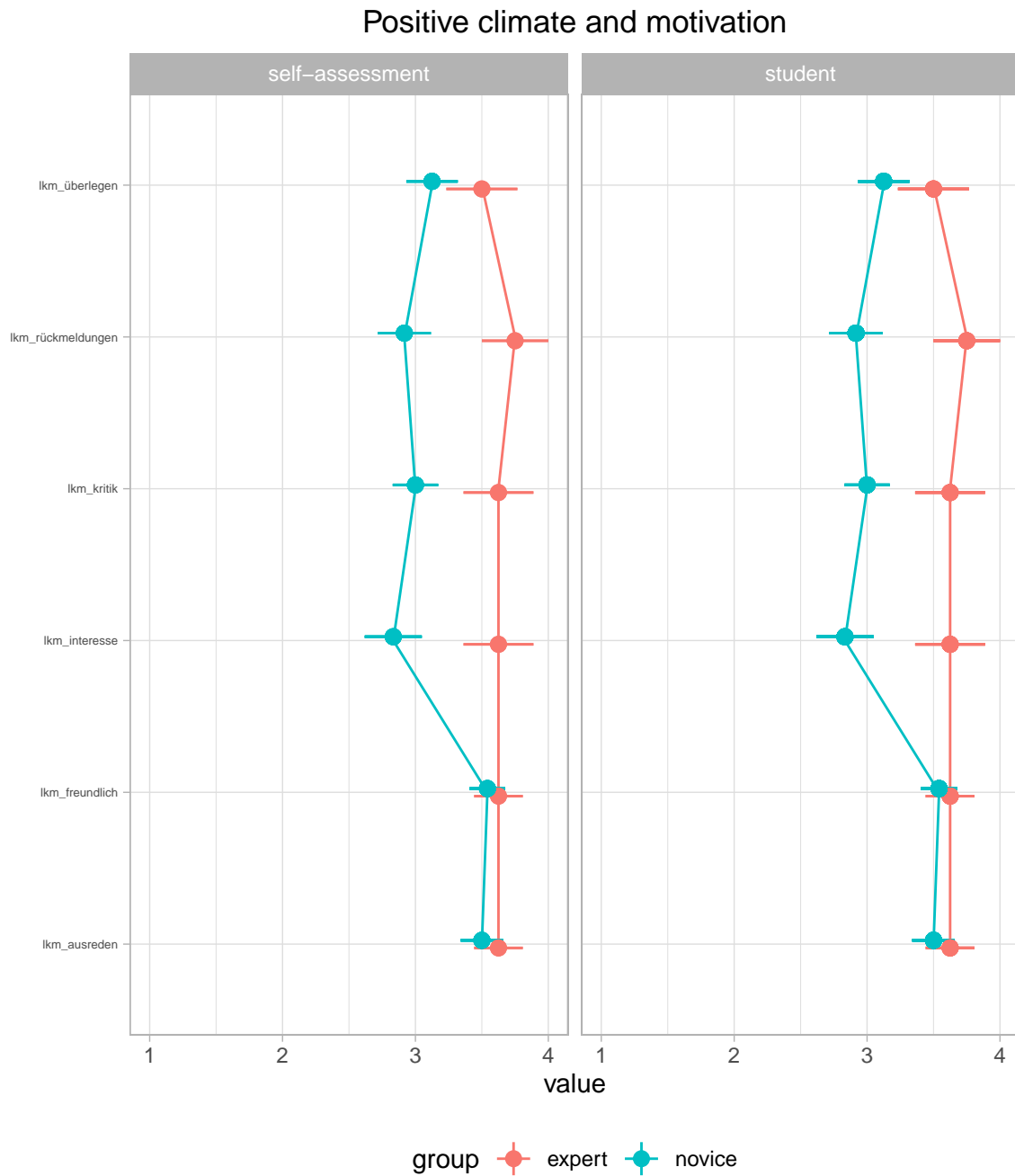
The individual items of a scale are further represented in graphs.

133

(1) Classroom management

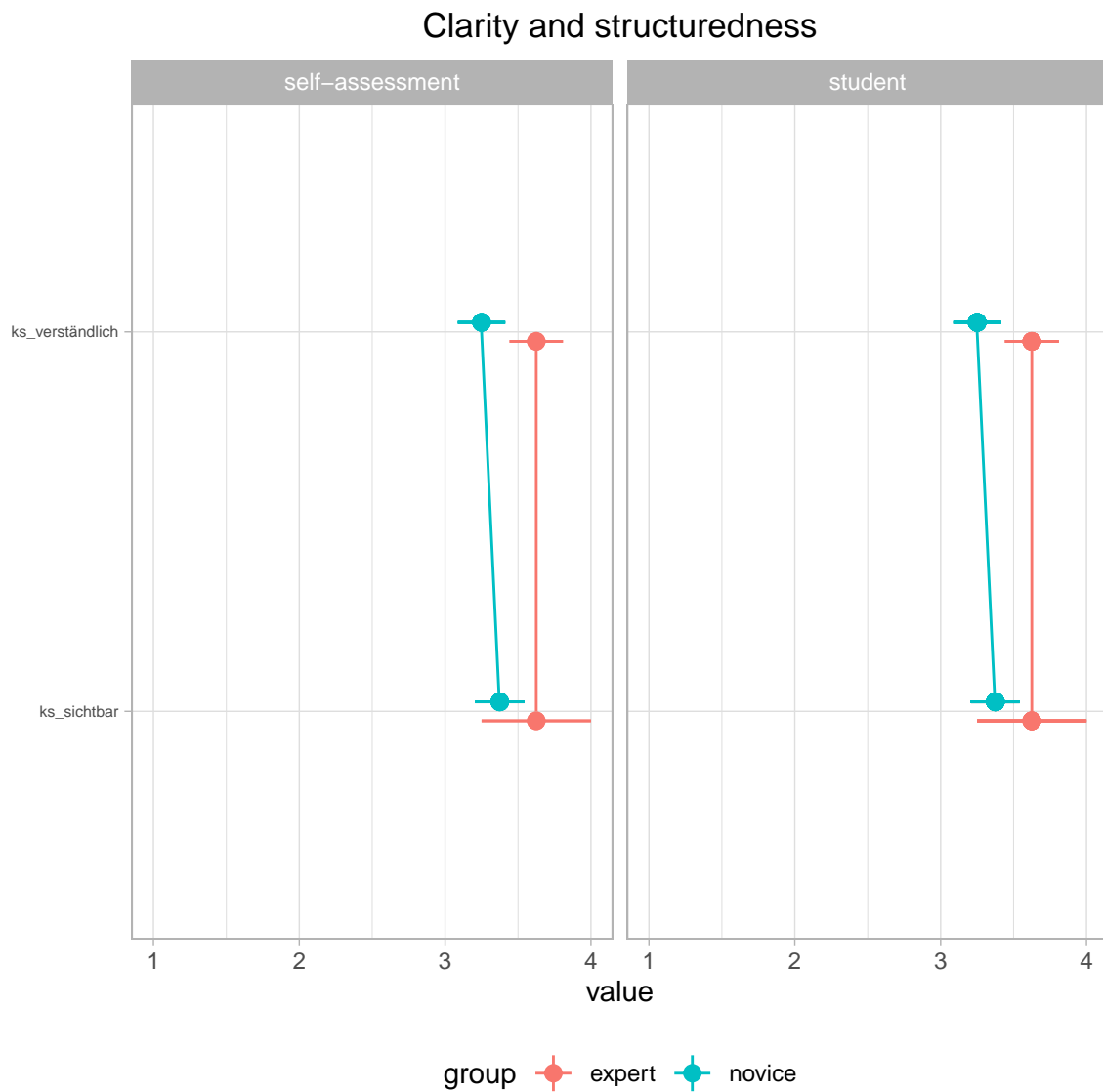


135 (2) Positive climate and motivation



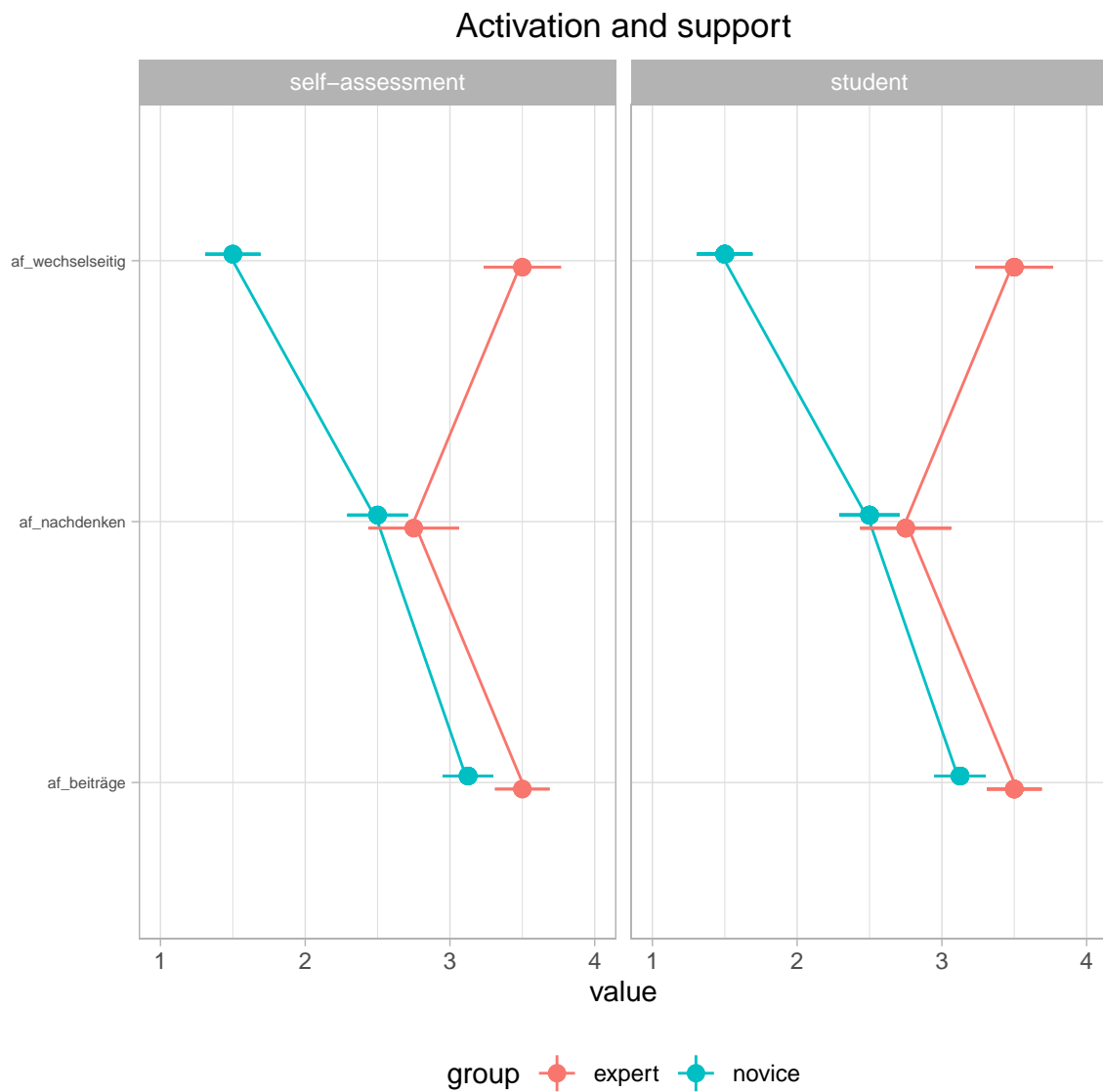
136

137 (3) Clarity and structuredness

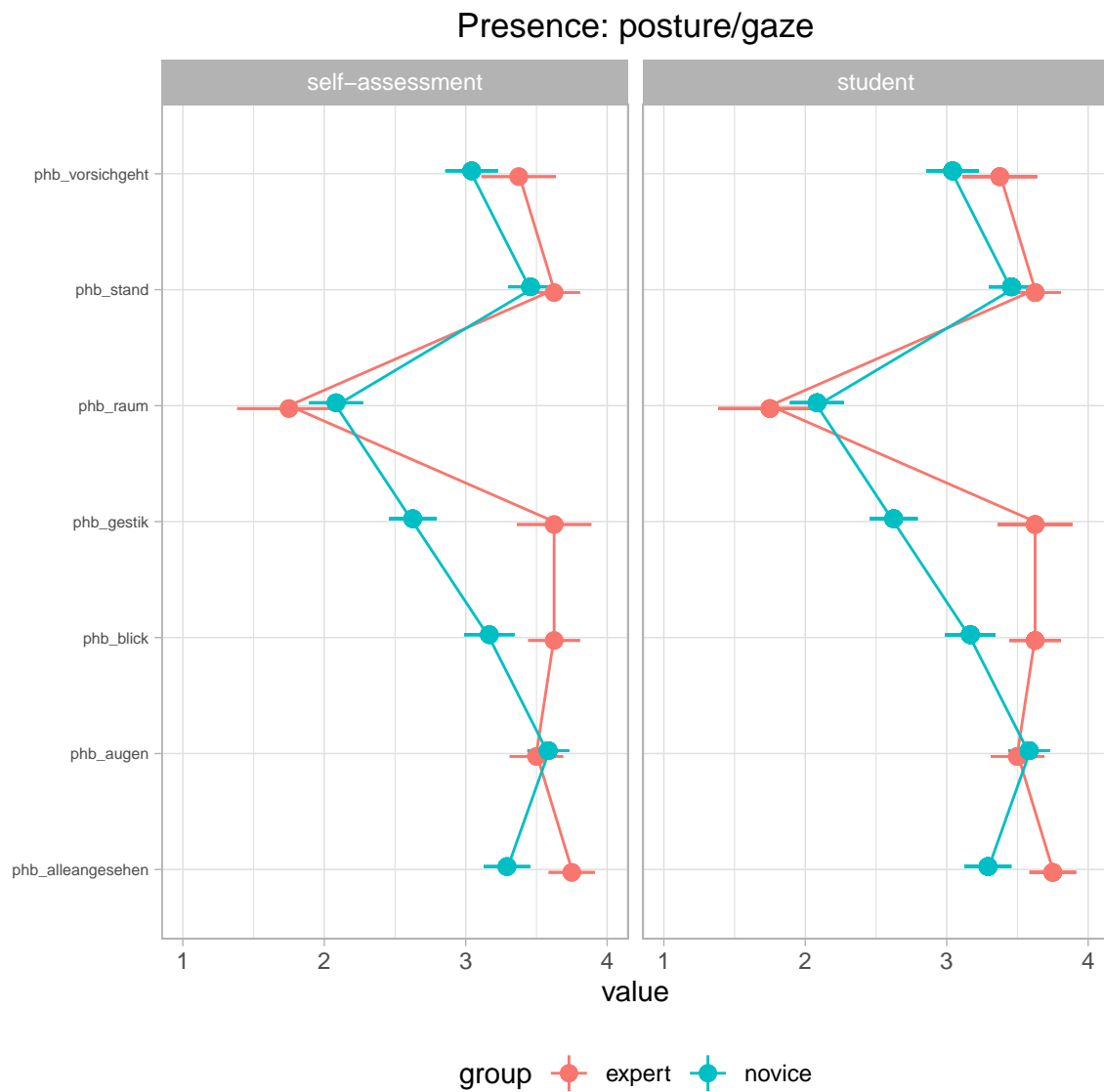


138

139 (4) Activation and support

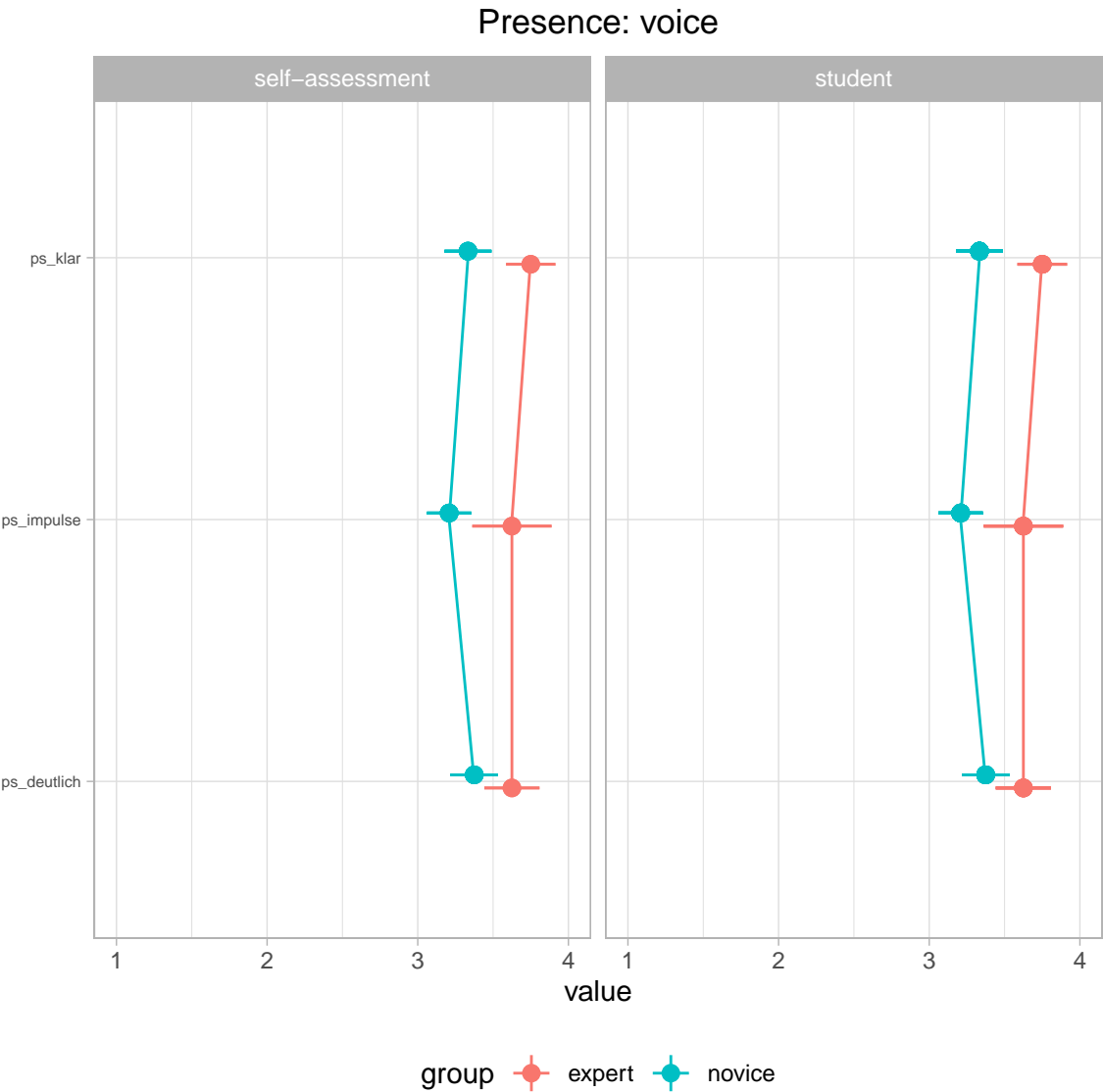


141 (5) Presence: posture and gaze



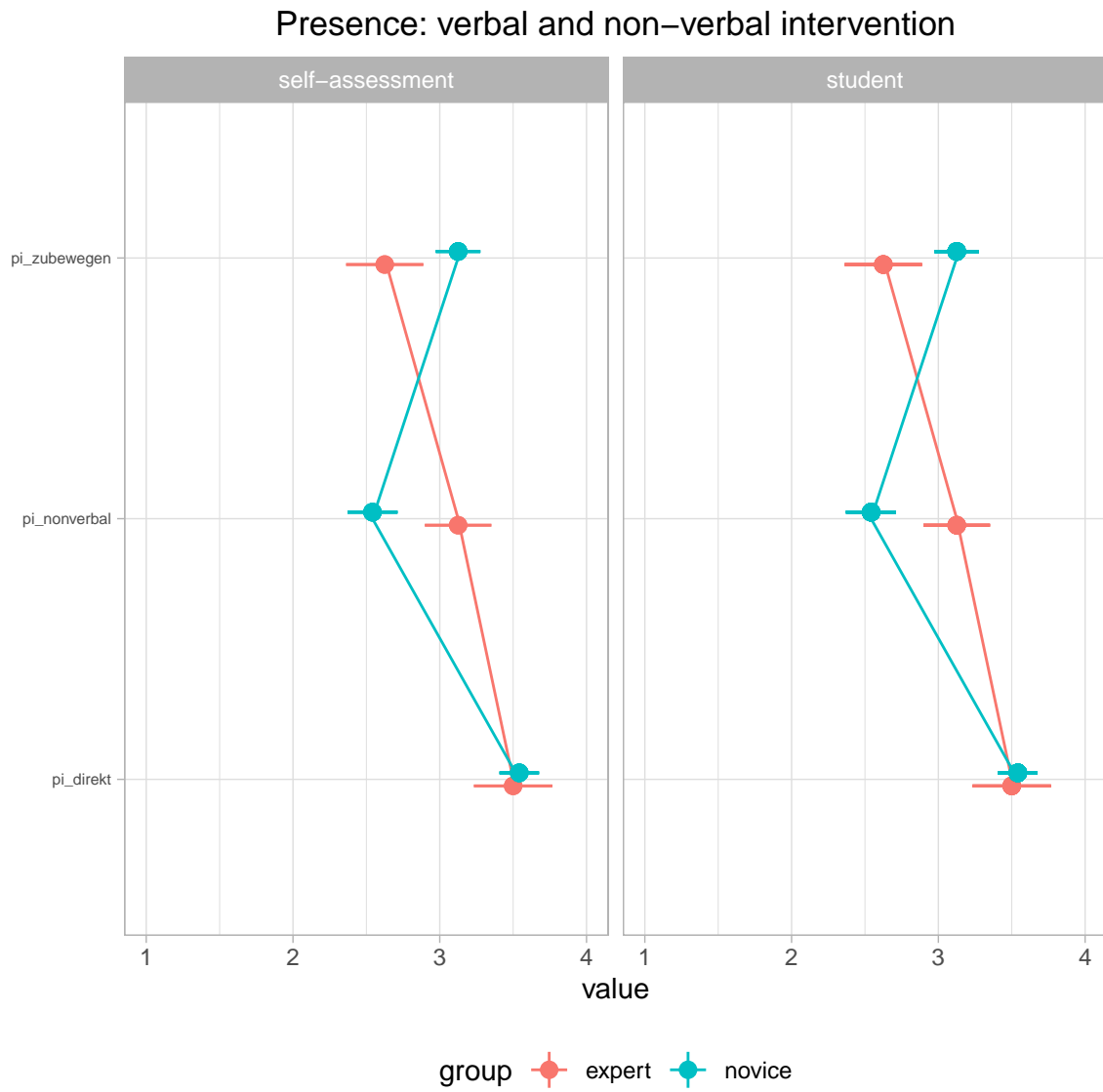
142

143 (6) Presence: voice



144

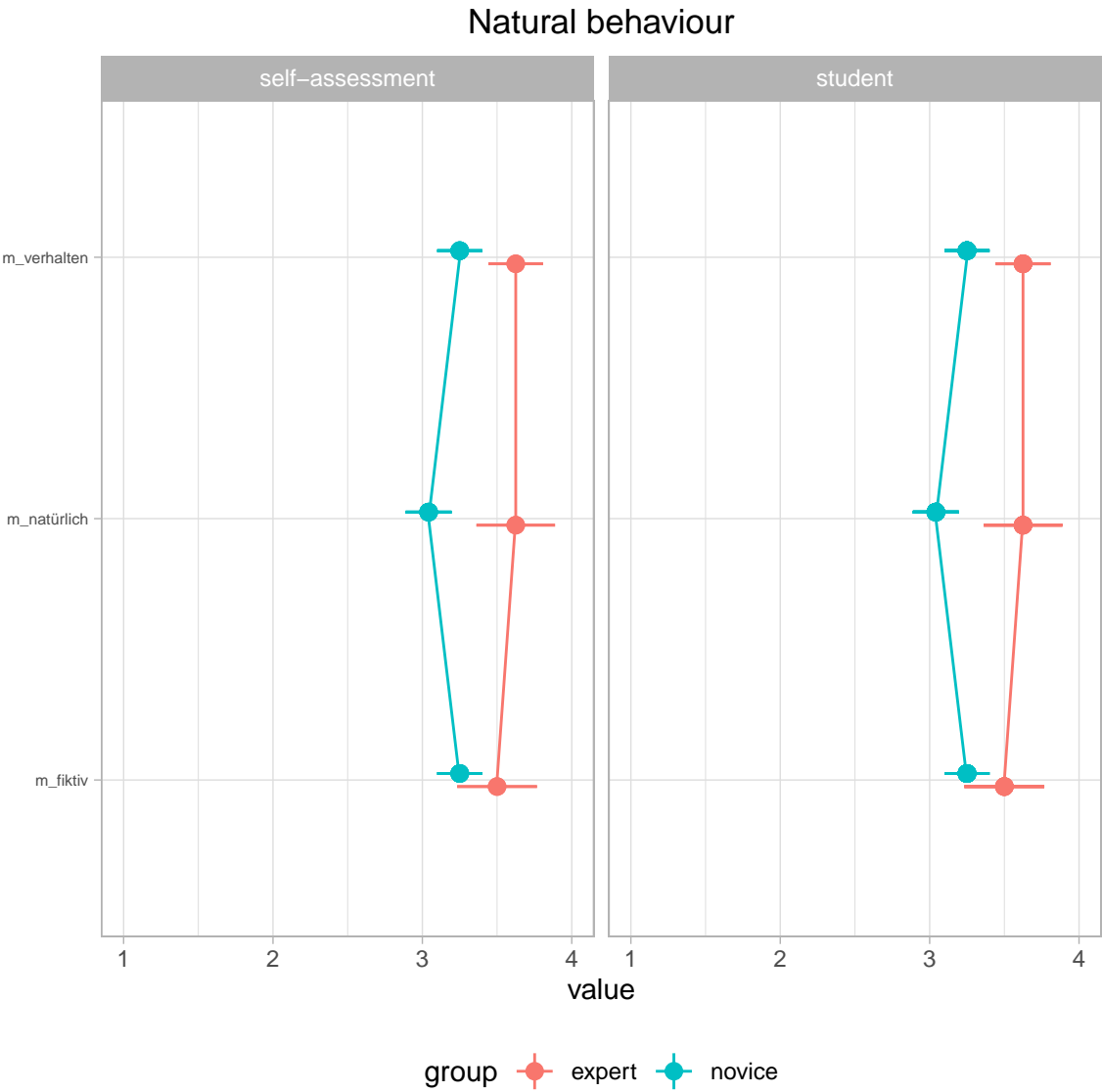
145 (7) Presence: verbal and non-verbal intervention



146

147

(8) Natural behaviour



148

In addition, we plotted all scales. Graph provides boxplots and individual data for experts and novices.

```
## Warning: Removed 1 rows containing non-finite values (stat_boxplot).
```

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## Warning: Removed 1 rows containing missing values (geom_point).
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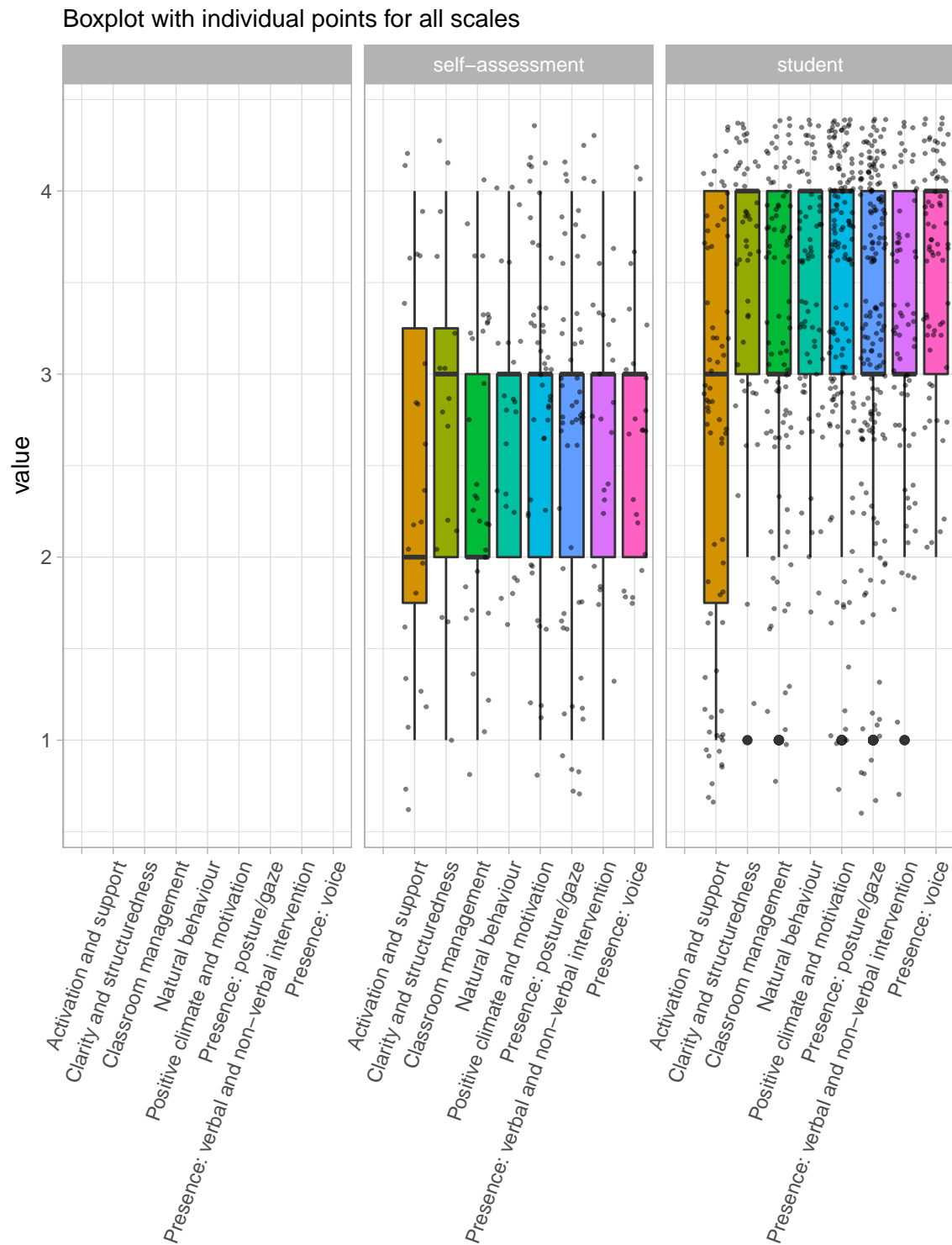


Figure 2. (#fig:boxplot scales)Boxplots and individual data for experts and novices

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