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How vertical and shared constructive leadership impact teachers' daily work engagement and affective states: a micro-longitudinal study

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ABSTRACT

Leadership in schools has been associated with a range of positive affective outcomes for teachers, as well as positive attitudes toward their work. However, most studies have used retrospective, one-time surveys. This study aims to clarify how leadership influences teachers' *daily* work-related attitudes and affective states. Using a micro-longitudinal design, it assesses constructive leadership behaviors of principals *('vertical constructive leadership')* and colleagues *('shared constructive leadership')* examining their associations with teachers' daily work engagement and pleasant affective states. Additionally, this study analyzes whether the quality of teachers' daily *work interactions* mediates the effects of leadership on outcomes. Multilevel structural equation modeling (MSEM) was used to analyze data from a baseline leadership survey and repeated assessments over a 10-day period (2 measures per day, $n = 1313$), stemming from 72 teachers in 15 public schools in Switzerland. Teachers reported experiencing both *vertical and shared constructive leadership*. However, only *vertical constructive leadership* was positively associated with interaction quality, pleasant affective states, and state work engagement. The effect of *vertical constructive leadership* on pleasant affective states was mediated by interaction quality. Principals seeking to enhance teachers' capacity for productive professional activities should increase constructive leadership behaviors as a fertile ground for positive social interactions among staff.

Introduction

The engagement and well-being of teachers during their daily work at school are crucial for providing effective instruction and supporting students' personal development (Frenzel et al., 2021; X. Huang et al., 2023). There is also evidence of the positive – and intuitively comprehensible – impact that leadership can have on teachers' work-related attitudes and emotions, and thus indirectly on student outcomes (Tan et al., 2020). However, most of these studies have focused on generalized

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and summative self-evaluations of staff members, such as overall job satisfaction or organizational commitment (Chin, 2007; Leithwood & Sun, 2012). Consequently, the qualities and ways in which leadership affects teachers' *day-to-day experiences of their professional activities* are neither theoretically conclusive nor thoroughly explored empirically. In other words: How does leadership within schools affect *specific attitudes and affective states* that are known to accompany and influence teachers' *daily work*?

The first aspect that accounts for the complexity of this question is that, from a theoretical perspective, leadership is a *multifaceted* phenomenon that includes not only various *forms* (often referred to as different 'models', see Bush & Glover, 2013, or 'styles', see; Kleefstra, 2019) but also different *sources* (Yammarino et al., 2012). Although many elaborated descriptions and studies focus on specific *forms* of leadership (such as instructional, e.g. Chin, 2007 or transformational, e.g. Leithwood & Sun, 2012), criticism is accumulating regarding a considerable conceptual overlap between these forms (DeRue et al., 2011; Rowold et al., 2015). A feasible way to tackle the problem of overlap is through an integrative approach that subsumes a range of *behavioral patterns* under the umbrella concept of *constructive leadership behavior* (Skogstad et al., 2014). This umbrella concept entails behaviors that are all constructive toward staff members and the organization and may unfold their positive effects synergistically (Skogstad et al., 2014; see also Mharapara et al., 2022; Nielsen & Taris, 2019). Regarding the potential *sources* of such leadership behaviors, we find an established distinction between those in formal leadership positions ('vertical leadership') and colleagues ('shared leadership'; Pearce & Sims, 2002). Consequently, both of these categorically different sources of leadership need to be examined simultaneously in order to fully understand where (constructive) leadership behaviors emanate and how they impact professionals' day-to-day experiences and activities (Yammarino et al., 2012).

A second challenge for researchers is that insights into the effects of leadership on *daily experiences* of professional work in schools remain blurred when theoretically plausible effects are investigated solely through retrospective survey reports at a single point in time. Data that are *all* collected through questionnaires at a single point in time are susceptible to common method biases as well as fragmented recall (see Podsakoff et al., 2003; Schwarz, 2012). If the goal is to capture *day-to-day work-related attitudes and affective states* of school staff, a micro-longitudinal design will provide more reliable results than a cross-sectional design. Thus, measuring perceived leadership *before* repeated assessments of daily experiences and with *different* instruments not only avoids common method biases but also provides a more immediate and nuanced view of daily work than retrospective reports, which do not match concurrent diary-like entries very well (Schwarz, 2012).

A third major issue, both theoretically and empirically, pertains to *modeling the pathways* through which constructive leadership from any source unfolds its effects. At present, studies on leadership explicitly or implicitly agree on the basic assumption that leadership is a process of social influence which aims at achieving shared goals (McClellan, 2022; Ruben & Gigliotti, 2016). However, although this process *occurs* through social interactions, comparably few studies in school settings *investigate* how interactional qualities among professionals are shaped by leadership behaviors and shape the participants' work experiences in turn (Vermeulen et al., 2022).

Our study addresses this research gap, proposing that social interactions *mediate* the effects of constructive leadership in schools on daily work engagement and affective states of teachers. Constructive leadership behaviors can affect the *quality of workplace social interactions* by making them pleasant, invigorating, satisfactory, and supportive (Skakon et al., 2010). These interactions, experienced as affective (such as 'invigorating') events, induce affective reactions ('states') and influence attitudes at work (Weiss & Cropanzano, 1996). Again, the question remains whether the *source* of constructive leadership behaviors plays a theoretically plausible and empirically demonstrable role in this mediation process.

It could be argued that a principal's span of control sets a natural limit to how frequently he or she can display constructive leadership behaviors toward individual teachers (Windlinger et al., 2020). Teachers interact primarily with their colleagues. Therefore, it seems plausible that constructive leadership behaviors among teachers, referred to as *shared constructive leadership* in this paper, are equally relevant for influencing teachers' daily work engagement and pleasant affective states as the same behaviors exhibited by the principal, referred to as *vertical constructive leadership*.

Taken together, our research questions address all the described issues: Are both *vertical constructive leadership* and *shared constructive leadership* related to teachers' daily work engagement and pleasant affective states? Does the quality of teachers' daily work interactions function as a mediator between constructive leadership behaviors and the outcomes of interest, irrespective of the source of these behaviors (principal, i.e. vertical variant, or colleagues, i.e. shared variant)?

Theoretical background and review of literature

Teachers' daily work-related attitudes and affective states

Workplace characteristics and affective events at work influence employee's thoughts and feelings, which are relevant for daily performance (Brief & Weiss, 2002). We focus on two indicators of work-related attitudes and affect that can vary depending on current events: pleasant affect and work engagement. *Pleasant affect* (or more precisely, pleasant affective states) refers to event-based feelings with positive valence that contribute to employee health and positive organizational functioning (Diener et al., 2020; Sonnentag, 2015). Experiencing positive affect offers benefits such as a wider scope of attention or a broader range of accessible options for action (Fredrickson & Losada, 2005). In schools, teachers' pleasant affect is linked to student motivation and well-being (Hascher & Waber, 2021; X. Huang et al., 2023). Moreover, recurring and highly conscious work-related feelings (usually termed teacher emotions) have been shown to influence teachers' instructional and relational behaviors in the classroom (Frenzel et al., 2021).

Work engagement is defined as 'a positive, fulfilling and work-related state of mind' (Hakanen et al., 2006, p. 498). Engaged employees exhibit high levels of energy (vigor), a strong involvement in their work (dedication), and deep immersion in their tasks (absorption). Work engagement was originally studied mostly as a trait, but increasingly also as a state, as diary studies have shown considerable within-person variation (D. Reis et al., 2016). For example, in Simbula's (2010) study of teachers, about 40 percent of the variance in daily work engagement (state work engagement) was within-person, i.e.

fluctuating from day to day. Work engagement is associated with positive organizational outcomes, such as job performance, and such effects are found in both, studies that examine between-person differences and in studies that examine within-person differences, i.e. fluctuations over shorter time periods (Sonnentag, 2015). A systematic review (Kristiana et al., 2018) identifies outcomes of teachers' engagement in various areas: attitudes toward students, personal gains (e.g. organizational commitment), and teaching performance. Concerning teaching performance particularly, L. Wang (2021) found a relationship between work engagement and student academic achievement. Additionally, Bakker and Bal (2010) showed that teachers' weekly engagement is positively related to their weekly in-role and extra-role performance.

Vertical and shared leadership in schools

Defining leadership as the process of influencing others to achieve shared objectives (Ruben & Gigliotti, 2016) does not predetermine its source. It can be performed by formally appointed leaders ('vertical leadership') as well as by coworkers ('shared leadership'; Pearce & Conger, 2003). For example, 'intellectual stimulation' as one of the prominent features of a 'transformational' pattern of leadership behaviors (Bass, 1999), could be offered to a team member by the principal as well as by a colleague. Therefore, in order to understand the effects of leadership in teachers' daily work life, it is necessary to consider both vertical and shared leadership (Yammarino et al., 2012). In addition, more theoretical explanations of the functional relationship between the two concepts in school settings are needed.

Shared leadership can be defined as 'a dynamic, interactive influence process among individuals in groups for which the objective is to lead one another to the achievement of group or organizational goals or both' (Pearce & Conger, 2003, p. 1). This concept is often used interchangeably with distributed leadership (see Hairon & Goh, 2015) or teacher leadership (Nguyen et al., 2020) due to their similarities. If teacher leadership is understood as a process of influencing other members of the organization independently of a formal position (as postulated by Schott et al., 2020, p. 6) it aligns with our understanding of shared leadership. Hence our approach to studying vertical and shared leadership parallels approaches that study principal and teacher leadership 'as separate but linked systems' (Sebastian et al., 2017, p. 466). Although shared leadership may serve as a *substitute* for vertical leadership to a certain degree, it is generally considered to be a *complementary* resource for goal attainment (Pearce & Sims, 2002). There is even evidence that transformational leadership from the principal is a precondition of shared leadership in schools (Printy et al., 2009). In this study, we treat them as correlated predictor variables since causal links between the two types of leadership cannot be inferred when they are assessed simultaneously.

Constructive leadership from different sources related to teachers' daily work engagement and positive affect

Several meta-analyses demonstrated positive effects of *vertical leadership* in schools, for leadership models such as transformational leadership (which emphasizes the principal's role in inspiring teachers to a shared vision, e.g. Leithwood & Sun,

2012) or instructional leadership (where the leader's focus is primarily on instruction and student outcomes; Hallinger et al., 2020). Similarly, positive effects are evident for leadership practices such as empowering and motivating teachers, for example by providing contingent rewards (a practice often subsumed under the model of 'transactional leadership', Tan et al., 2020). Despite the day-to-day variation in leadership behaviors (Kelemen et al., 2020), leaders still display *general patterns of behaviors*, such as some leaders generally exhibiting more transformational behaviors than others.

Principals have effects on school outcomes, such as instructional improvements, but first and foremost on their teachers' work environment, including shared decision-making, shared goals, and organizational culture. Teacher-level outcomes that are influenced by leadership in schools include teacher retention, teaching practices, and teacher well-being (Liebowitz & Porter, 2019). A review on teachers' engagement as well as a recent systematic review on teacher well-being indicators, including work engagement and positive affect, both identify leadership as one important antecedent (Hascher & Waber, 2021; Kristiana et al., 2018). Berkovich and Eyal's (2015) narrative review of studies on educational leaders and emotions highlights positive effects of principals' relationship-oriented behaviors. Other studies show that transformational leadership (Barbieri et al., 2019) and autonomy-supportive leadership (Collie et al., 2018) impact teacher emotions and attitudes. Apart from these person-focused leadership behaviors, there is also evidence that more task-focused behaviors, such as forms of transactional leadership (especially providing contingent rewards and monitoring performance) are positively associated with outcomes such as teacher affiliation (Oterkiil & Ertesvåg, 2014) as well as commitment and job satisfaction (Nguni et al., 2006) in schools. Similar evidence comes from studies that are not school-specific: Leaders influence employee affect directly through their affective displays and indirectly through different mediating pathways such as a positive work environment (Ashkanasy & Humphrey, 2014). In their systematic review, Skakon et al. (2010) document that positive leader behaviors and transformational leadership are linked to employee affective well-being. Also, several studies connect vertical leadership to work engagement (e.g. Breevaart et al., 2014; Tims et al., 2011).

Although the evidence for *shared leadership* is not as extensive as that for vertical leadership, it does attest to positive affective outcomes such as team member well-being or job satisfaction (Edelmann et al., 2020; Zhu et al., 2018). In schools, concepts similar to shared leadership, like distributed or teacher leadership, are associated with teacher job satisfaction and self-efficacy (Liu et al., 2021; Nguyen et al., 2020).

Overall, the literature indicates that various leadership behaviors, such as *empowering*, *transformational*, or *rewarding/transactional* behaviors, are related to employee affect quality and attitudes toward their work (Pletzer et al., 2023), regardless of the leadership *source*. These findings are not overly surprising considering the conceptual overlap between the investigated *forms* of impactful leadership (Rowold et al., 2015). In addition, leaders do not restrict their behaviors to one style only but exhibit a wide range of behaviors that span different theoretical leadership models (Tan et al., 2020). Therefore, it is useful to subsume the relevant behavioral patterns under the umbrella concept of constructive leadership behavior. This concept encompasses all leadership behaviors that are *constructive towards staff members and the organization* (Skogstad et al., 2014; see also Mharapara et al., 2022; Nielsen & Taris, 2019; Pletzer et al., 2023).

We are not aware of any study that directly compared the respective connections of constructive leadership from both sources with work-related experiences of the staff within a single study. It remains thus unclear whether *vertical constructive* and *shared constructive leadership* behaviors are differentially related to work-engagement and pleasant affect.

Quality of social interactions as a mediator of leadership effects

Social interactions at work are an important part of daily professional life (Tschan et al., 2004). In schools, interactions with colleagues and the principal can play a vital role for integrating teachers into the school's social system. Moreover, different types of interactions (such as an informal chat or a request for problem-solving assistance) contribute to different aspects of social integration, such as building trustful bonds or reaching a performance goal through instrumental support from team members. Additionally, subjective evaluations of the pleasantness and positivity of the interaction capture interactional qualities that enhance human capacity (Heaphy & Dutton, 2008).

Constructive leadership and social interactions

The effect of leadership on social interactions at work can be manifold. In the case of *vertical constructive leadership*, the leader personally influences interaction quality through behaviors like providing support, giving feedback, or clarifying goals (Skakon et al., 2010). Leaders also influence interaction quality by shaping organizational culture and a positive work environment (Ashkanasy & Humphrey, 2014). Bono et al. (2007) found that employees with supervisors that exhibited high transformational leadership experienced more positive emotions not only during their interactions with these supervisors, but also during interactions with colleagues and customers. By communicating shared goals and meaning, leaders encourage employee cooperation to reach these goals and, thereby, increase social support among coworkers (Heaphy & Dutton, 2008). We propose that documented effects of school leadership on overall 'school organizational health' (Liebowitz & Porter, 2019) are also present in the quality of interactions that teachers experience every day.

Shared constructive leadership occurs primarily in social interactions, although not in every social interaction leadership is enacted. Thus, faculties in which shared leadership is practiced also display various indicators of relationship quality among its members, including trust (Drescher et al., 2014) and enhanced cooperation and cohesion (D. Wang et al., 2014). Zhu et al. (2018) report further proximal outcomes of shared leadership linked to relationship quality and, by extension, to interaction quality, such as reduced conflict, increased team psychological safety, well-being of team members, and team learning behavior.

Social interactions, pleasant affect, and work engagement

Social interactions at work can be seen as affective events (Weiss & Cropanzano, 1996). When employees experience positive interactions with coworkers, they report more positive affect and higher work engagement (Sonnentag, 2015). In addition, research shows similar effects for interactions with leaders, e.g. positive exchanges with the supervisor were related to weekly work engagement (Bakker & Bal, 2010). Social interactions are also the vehicles of social support. In schools, the amount of daily social support teachers received was related to their state work engagement (Simbula, 2010); experiencing compassion was related to teacher positive affect (Eldor & Shoshani, 2016).

Using a micro-longitudinal design with repeated assessments to capture effects of leadership

The micro-longitudinal design (see Li et al., 2022) allows for the temporal separation of leadership assessments (predictor variable), social interactions (mediator variable) and daily attitudes and affect (outcomes). Thus, it reduces issues commonly associated with cross-sectional designs such as common method bias (Podsakoff et al., 2003). Repeated assessments, also known as diary methods (Lischetzke & Könen, 2020), facilitate the examination of the impact of leadership on work events and their association with indicators of work-related well-being that fluctuate over time (Sonnentag, 2015).

This design captures 'life as it is lived' (Bolger et al., 2003, p. 579) and provides insight into the processes at work (Ohly et al., 2010). Such studies complement existing leadership research (Ohly & Gochmann, 2015) by elucidating the mechanisms through which leadership affects employees' affective well-being (Skakon et al., 2010). Some studies have focused on leadership as a relatively stable workplace characteristic, examining interactions with the leader and their relationship to employees' daily well-being (see Ohly & Gochmann, 2015). Since we are interested in both *vertical* and *shared constructive leadership*, we also examine how they are translated into interactions between teachers, influencing a range of immediate and longer-term outcomes. Overall, repeated assessments allow for the examination of experiences almost in 'real-time', providing a more valid picture of teachers' interactions and their work-related attitudes and affective states compared to retrospective reports with global ratings (Bolger et al., 2003).

Conceptual model and hypotheses

As documented above, teachers' daily engagement and pleasant affect at work can be influenced by constructive types of leadership from both the principal (*vertical constructive leadership*) and colleagues (*shared constructive leadership*). Perceived leadership in a school is assessed as frequency of a broad range of leadership behaviors displayed by principals and colleagues. This background level of leadership behavior sets the stage for daily interactions and practices at work. Figure 1 presents a conceptual model that integrates the relationships between *vertical and shared constructive leadership*, social interactions at work, and teachers' daily performance-relevant work-related attitudes and affective states. Based on the literature review, we propose:

Hypothesis 1: *Vertical* and *shared constructive leadership* are positively related to teachers' experienced states of (a) pleasant affect and (b) work engagement during their daily professional activities.

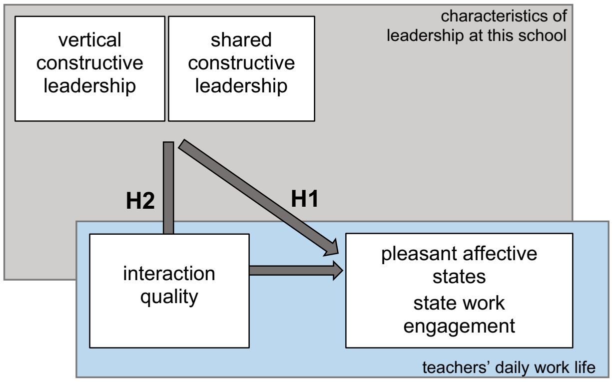

Figure 1. Conceptual model and study hypotheses (H).

Hypothesis 2: The effect of *vertical* and *shared constructive leadership* on (a) teachers' pleasant affective states and (b) teachers' state work engagement is mediated via interaction quality.

Method

Participants and procedure

We recruited 72 teachers from 15 public schools providing compulsory schooling on preschool, primary and lower secondary levels in the German-speaking part of the cantons Berne and Solothurn, Switzerland, to participate in our study over a period of 10 working days. This sample size is adequate for a micro-longitudinal study, as the number of assessments sampled plays a major role. Nezlek (2020) recommends at least 50 participants and 7 days of assessments for this kind of design.

The participants comprised of 55 (76.4%) female and 17 (23.6%) male teachers with a mean age of 43.8 ($SD = 11.3$) years. On average, they had 17.8 ($SD = 11.0$) years of experience in teaching and 12.0 ($SD = 10.5$) years of tenure in the current school. All teachers had a teaching qualification for either preschool, primary, lower, or higher secondary level or special needs education. The number of students in the 15 schools ranged from 79 to 710 ($M = 337{,}6$; $SD = 186.4$). There were 12 schools with 5 participating teachers, two schools with 3 teachers and one school with 6 teachers ($M = 4.8$ teachers per school). A comparison with teacher population data from the Swiss Federal Statistical office showed that the sample is representative with respect to teacher age distribution and gender, but small schools were underrepresented (data available from the authors).

To recruit the participants, we approached the principals of public schools in the two cantons in random order by e-mail and telephone. Principals who agreed to participate were asked to identify five teachers in their schools, i.e. direct reports who worked full-time or part-time, at least 3 days per week. As an incentive, all participants received individualized feedback on the descriptive results of the study and were entered into a draw to win one of three tablet computers after data collection. Teachers first received a link to an online survey. A member of the research team then visited each school to clarify questions and to obtain written consent from the teachers. Each participant was assigned a personal ID code to pseudonymize the data and informed of the right to withdraw at any time without giving a reason. None of the participants withdrew from the study prematurely.

After teachers filled in the initial online survey on leadership, we conducted repeated assessments over 10 working days (two weeks for full-time teacher, longer for part-time teachers). Teachers received e-mails with links to online assessments twice a day (midday and evening). The response rate was very good with a mean of 18.23 (SD = 2.58) entries per participant, resulting in a total of 1313 data points.

Measures

Leadership survey

Vertical and shared constructive leadership were measured with 12 items each (Piecha et al., 2012, based on Pearce & Sims, 2002). The items assess how often the principal of the school (*vertical constructive leadership*)/the team colleagues (*shared constructive leadership*) show a range of constructive leadership behaviors. In particular, the questions cover transformational, empowering, and transactional leadership behaviors with 4 items each. Exemplary items for transformational behaviors are 'My principal gets me to look at problems from many different angles' (vertical leadership) and 'My team colleagues get me to look at problems from many different angles' (shared leadership); for empowering behaviors: 'My principal shows me how to solve problems independently' (vertical leadership) and 'My team colleagues show me how to solve problems independently' (shared leadership); and for transactional behaviors: 'My principal offers me help in return for my efforts' (vertical leadership) and 'My team colleagues offer me help in return for my efforts' (shared leadership). The response scale ranged from *never* (1) to *regularly, almost always* (5). Internal consistencies reached $\alpha = .91$ for vertical and $\alpha = .80$ for *shared constructive leadership* items. Because teachers at each school rated the leadership behavior of the same principal, we formed an aggregate variable by averaging teachers' scores to a school mean for *vertical constructive leadership*.

Repeated assessments

To minimize the burden on participants, who had to complete short questionnaires twice daily for 10 days, we kept the scales brief and chose the following three measures that had been used successfully in previous repeated assessment studies.

Pleasant affective states were assessed with three positive adjectives ('well', 'fresh' and 'serene') from the Multidimensional Mood Questionnaire (MDBF, Steyer et al., 1997). Participants indicated how they felt 'at this moment' on a scale from *not at all* (1) to *very much* (5). Composite reliability coefficients (McDonald's Omega, see Morin et al., 2014, p. 158; ω within = .76; ω between = .96) indicated satisfactory reliability.

State work engagement was measured with three items from the state version of the Utrecht Work Engagement Scale, each item representing a subscale: vigor, dedication and absorption (Breevaart et al., 2012). The wording was adjusted from 'today' to 'during the past half-day', e.g. 'During the past half-day, I was enthusiastic about my work'. Participants responded on a 7-point scale ranging from *strongly disagree* (0) to *strongly agree* (6). Reliability was good (ω within = .99; ω between = .93).

Quality of social interactions at work were reported by the teachers with a clear focus on work with adults, not students: 'Did you have an interaction in the past half-day that lasted at least 10 minutes or was especially meaningful?' (adapted version of the Rochester Interaction Record, H. T. Reis & Wheeler, 1991; see also Tschan et al., 2004 for application in a work setting). They specified the professional roles of their interaction partners (up to three partners in one interaction) and rated four aspects of interaction quality on a scale from *not at all* (1) to *very much* (7): how pleasant, how relieving (as opposed to stressful) the interaction was, how supported they felt by their interaction partner/s, and how satisfied they were with the outcome of the interaction. Teachers could report up to three interactions per half-day. The mean rating of interaction quality per half-day was calculated and used in the analysis. Reliability was good (ω within = .86; ω between = .83).

Strategy of analysis

Because of dependencies in the data, we estimated multilevel structural equation models (MSEM), covering the level of interaction-records of each teacher and the level of individual teachers (repeated measures nested in persons). Analyses were run with Mplus 8.10 (Muthén & Muthén, 1998–2021). Intra-class correlations (ICCs) indicated significant within- and between-person variance in all variables that were measured with the repeated assessments (Table 1).

As our sample at the school level (15 schools) was too small to estimate three-level multilevel models, we specified two-level models (741 assessments with interaction records nested within 72 teachers) while considering the clustering at the school level by using a sandwich estimator. This allows to compute standard errors of model parameters, which are corrected for potential sampling differences (Muthén & Muthén, 1998–2021). To back up our results we also ran analyses using fixed effects models (F. L. Huang, 2014), i.e. two-level models with dummy variables for the different schools in the sample, and then used post hoc contrasts to show that there are differences in the outcome variables in schools with high versus low *vertical constructive leadership*. The results presented here are corroborated by the results of these analyses (available on request from the authors).

To test hypothesis 1, we calculated the direct effects of *vertical* and *shared constructive leadership* on pleasant affective states and state work engagement (see Figure 2). To test

Table 1. Intraclass correlation coefficients, means, standard deviations, and intercorrelations for study variables.

Variable	ICC	M (SD)	1	2	3	4	5
(1) Pleasant affect ($T = 736$)	.24	3.66 (0.66; 0.37)	–	.47**	.59**	.23	.10
(1) State work engagement ($T = 737$)	.26	5.47 (1.00; 0.59)	.41**	–	.47**	.30**	.08
(1) Interaction quality ($T = 739$)	.21	5.80 (1.01; 0.52)	.22**	.19**	–	.34*	.24*
(1) Vertical constructive leadership		3.77 (0.37)				–	.27*
(1) Shared constructive leadership		3.60 (0.52)					–

Standard deviations (within-level; between-level). Intercorrelations at the within-level are in the lower diagonal and at the between-level in the upper diagonal. $N = 72$; T = number of half-days; ICC = intraclass correlation coefficients (variance between persons); the leadership variables (4/5) and the variable pleasant affect (1) were measured on 5-point scales; the other variables (2/3) were measured on 7-point scales.
$^{*}p < .05$; $^{**}p < .01$.

hypothesis 2, we also included interaction quality at the level of daily assessments and estimated a multilevel mediation model (MSEM, 2-1-1 mediation model, Preacher et al., 2010, p. 210, see Figure 3). Both predictor and mediator variables were centered at the grand mean. To test the significance of indirect effects, we constructed 95% confidence intervals using Monte Carlo simulation procedures (Preacher & Selig, 2012). Gender and teacher age were controlled for in all these calculations.

Results

Descriptive analyses

On average, teachers experienced *vertical* ($M = 3.77$, $SD = 0.37$) as well as *shared* ($M = 3.60$, $SD = 0.52$) *constructive leadership* behaviors in a frequency they characterized between *once in a while* and *often* (see Table 1).To check for systematic differences regarding leadership between schools, ICCs for the school level were calculated: The ICC of .01 for *shared constructive leadership* shows that almost all of its variation lies between persons. Thus, we find no systematic differences between schools of the sample. The ICC of .12 for *vertical constructive leadership*, on the other hand, suggests that 12% of the variations in vertical leadership are attributable to the school level. This was expected, as teachers in a school all rated the same principal and supported the aggregation to a school mean.

Teachers reported, on average, 14 interactions ($M = 13.75$, $SD = 7.48$) during the repeated-assessments phase, which results in 741 assessments with interaction records (of 1313 total). This data set was used for further analyses. In 72.7% of these measurement points, teachers reported one interaction, in 20.9% two and in 6.3% three interactions. Most interactions (72.9%) involved one partner, 17.7% involved two partners and 9.4% involved three partners. Most interaction partners were other teachers ($M = 12.35$, $SD = 7.60$), followed by parents ($M = 2.29$, $SD = 3.53$); principals ($M = 1.38$, $SD = 1.44$) and others ($M = 2.43$, $SD = 3.17$). It is interesting to note that teachers only reported very few interactions with the principal during the 10 days of the study. Overall, teachers rated the quality of the interactions as good ($M = 5.80$ on a 7-point-scale).

Test of hypotheses

Hypothesis 1 states that both *vertical* and *shared constructive leadership* are positively related to teachers' daily work engagement and positive affect. Results (see Figure 2) show that *vertical constructive leadership* is positively related to pleasant affective states ($B = 0.23$, $SE = 0.10$, $p = .02$) and state work engagement ($B = 0.44$, $SE = 0.11$, $p < .001$), which means that teachers in schools with stronger *vertical constructive leadership* report more pleasant affect and higher state work engagement over the half-days. No such effects were found for *shared constructive leadership*. Therefore, results are in line with hypothesis 1 only for *vertical constructive leadership*, enacted by the principal.

Hypothesis 2 proposes that the effects of *vertical* and *shared constructive leadership* on state work engagement/pleasant affect are mediated through interaction quality. Results (Figure 3) reveal that *vertical constructive leadership* is indeed positively related to interaction quality ($B = 0.35$, $SE = 0.15$, $p = .02$). Again, no effects were found for *shared constructive leadership*. Concerning the link between interaction quality and outcomes,

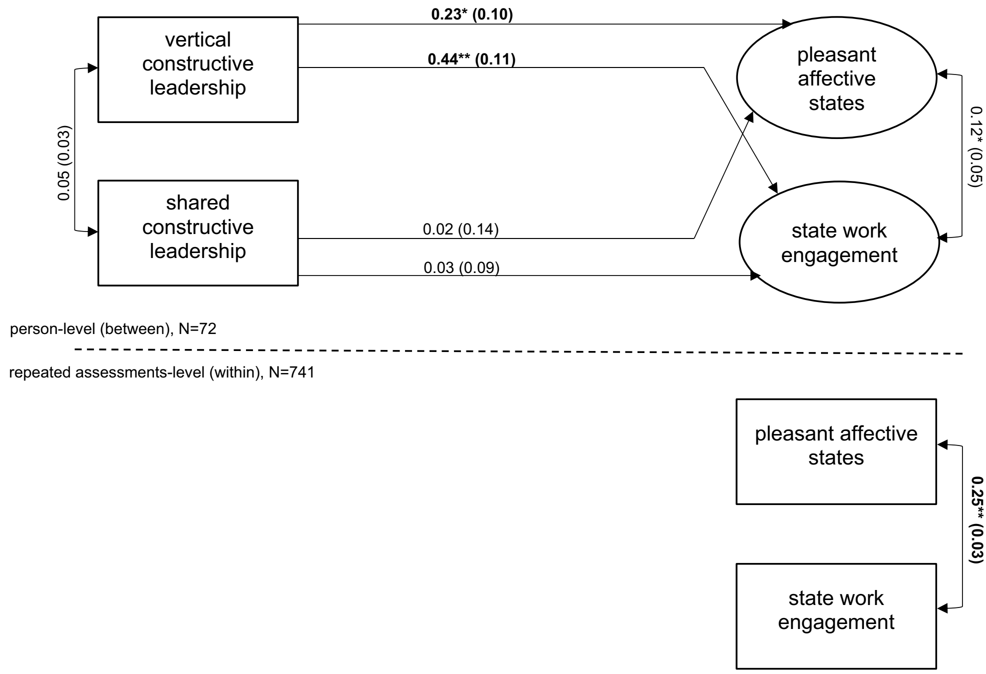

Figure 2. Multilevel structural equation modeling results for hypothesis 1. Unstandardized estimates and standard errors are shown. Bold font indicates significant paths. Controlled for teacher age and gender. *$p < .05$; **$p < .01$.

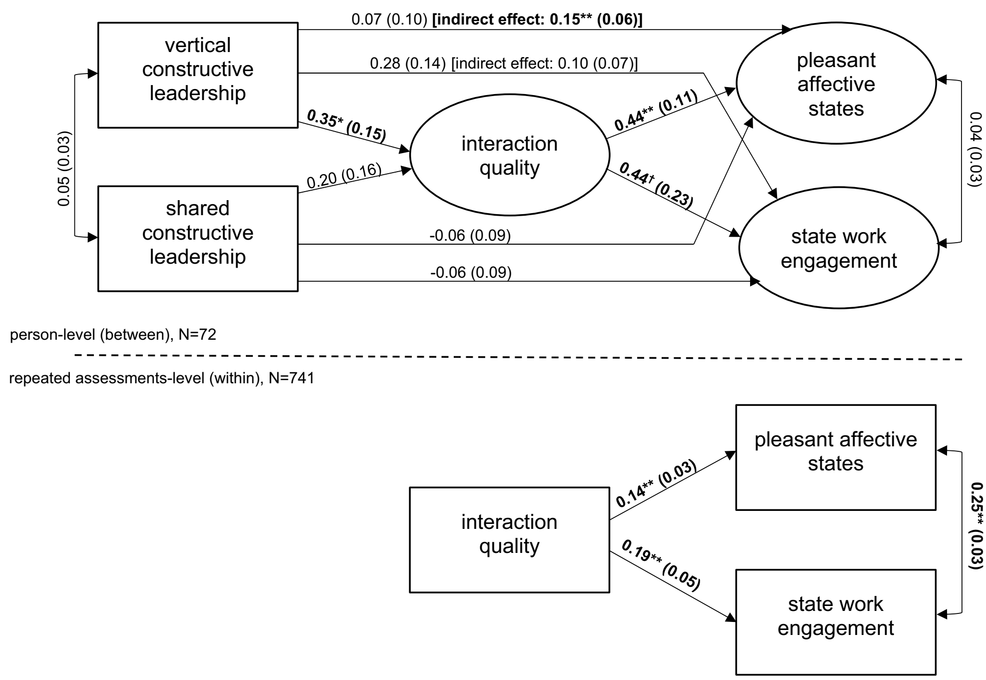

Figure 3. Multilevel structural equation modeling results for hypothesis 2. Unstandardized estimates and standard errors are shown. Bold font indicates significant paths. Controlled for teacher age and gender. †$p < .10$; *$p < .05$; **$p < .01$.

results show that on the *within-person* level, interaction quality is associated with pleasant affect ($B = 0.14$, $SE = 0.03$, $p < .001$) as well as with state work engagement ($B = 0.19$, $SE = 0.05$, $p < .001$), such that on half-days with higher interaction quality each teacher reports more pleasant affect and higher state work engagement than on half-days with lower interaction quality. When looking at the same relationship on the *between* person level, we see that interaction quality is related to pleasant affect ($B = 0.44$, $SE = 0.11$, $p < .001$) but not to state work engagement ($B = 0.44$, $SE = 0.23$, $p = .06$). That means that people who experience higher interaction quality over their workdays also report higher levels of pleasant affect compared to people with lower interaction quality. The same (positive) relation also appears for interaction quality and state work engagement, but just misses the alpha-level of .05 ($p = .06$).

Because neither interaction quality nor teachers' daily work engagement and affective states are systematically related to *shared constructive leadership* among teachers, we calculated indirect effects only for *vertical constructive leadership*. Tests revealed one indirect effect, i.e. the effect of *vertical constructive leadership* on pleasant affect is mediated by interaction quality (indirect effect = 0.15; 95% CI [0.04, 0.27]). The direct effect of *vertical constructive leadership* on pleasant affect in this model was not different from zero ($B = 0.07$, $SE = 0.10$, $p = .649$), indicating that the effect was *mediated* through interaction quality. Results are therefore only partly in line with hypothesis 2, as we found only one of two potential indirect effects for *vertical constructive leadership*, namely on pleasant affect via interaction quality (but not on state work engagement) and no indirect effect for *shared constructive leadership*.

Discussion

We examined the relationship between *vertical* and *shared constructive leadership* (as antecedents), qualities of teachers' daily interactions at work (as mediators) and teachers' states of pleasant affect and work engagement (as consequences). Our study contributes to the existing literature through

- using a micro-longitudinal design with repeated assessments, which is better suited to capture teachers' real-life experiences during their daily professional work than common one-time survey items,
- overcoming the issue of overlap between conceptually and often also empirically related leadership constructs by assessing multiple facets of leadership that are theoretically postulated to be constructive behaviors,
- taking into account that the enactment of leadership might not be limited solely to the principal, by considering different potential sources of constructive leadership behaviors simultaneously,
- an additional focus on social interactions to elucidate the pathways through which leadership unfolds its effects in teachers' professional sphere of action.

Vertical constructive leadership, social interactions, and their relations to daily work engagement and pleasant affective states

Results of multilevel analyses indicated that teachers who perceived their principal as engaging more frequently in *vertical constructive leadership* – transformational, transactional, and empowering behaviors – reported (a) better overall interaction quality, (b) higher levels of pleasant affect, and (c) higher levels of state work engagement throughout their workdays. The micro-longitudinal data reveal that teachers' work engagement and pleasant affect fluctuated throughout the day, partly as a function of the pleasantness, satisfaction, and support in the social interactions they experienced at work. Most of these interactions were with other teachers, followed by parents. Thus, the amount of constructive leadership behaviors perceived from the principal (as an antecedent to subsequent interactions at work) appeared to have a positive effect on how teachers conducted and experienced most of their social interactions in subsequent workdays – suggesting that *constructive leadership from the principal* creates a *productive foundation* for an *organizational climate* that contributes to the quality of interactions. Thus, vertical leadership influences teachers' daily work-related affect through the experience of quality interactions at work.

This finding deserves a closer inspection with respect to the state of research. Our school-based study highlights one important indirect pathway through which leader behavior affects employee outcomes. Despite principals having less frequent face-to-face contact with teachers compared to teachers' interactions with each other, they still influence the way teachers interact and their work-related attitudes and affective states. This influence likely stems from leaders' impact on organizational culture – e.g. through allocating resources, acting as a role model, sharing responsibility, or creating shared values – thus fostering a positive work environment characterized by collaboration, trust, and positive social interactions (Wahlstrom & Louis, 2008). This finding is consistent with a recent study showing indirect effects of principal leadership on teacher outcomes via supportive school culture and teacher collaboration (Liu et al., 2021). Additionally, our results show a relationship between *vertical constructive leadership* and state work engagement, albeit not mediated by interaction quality. In light of the arguments just mentioned, it seems most plausible that leadership effects on teacher state work engagement operates through other mediators than those for teachers' affective states. Such mediators might be granted job resources like autonomy or induced day-level optimism, which were not measured in our study (e.g. Breevaart et al., 2014; Tims et al., 2011).

Shared constructive leadership, social interactions, and their relations to daily work engagement and pleasant affective states

Recognizing that teachers interact primarily with colleagues, we expected that *shared constructive leadership* would be equally important as *vertical constructive leadership* in predicting teachers' interaction quality, pleasant affect, and engagement. In our sample, however, we did not find such effects of *shared constructive leadership*. It is important to note that *on average*, teachers did report experiencing *shared constructive leadership* at their workplace, even to similar degrees as *vertical constructive leadership*. Yet, teachers from *the same school* did *not converge* in their perceptions of *shared constructive leadership*, and *shared constructive leadership* was not related to interaction quality, work-related attitudes and affective states of teachers.

This lack of convergence among teachers' experiences of shared leadership contradicts earlier studies (e.g. Pearce & Sims, 2002), which typically *aggregate* individual perceptions of shared leadership to the team level, treating shared leadership as a team property.

This approach has been criticized though because ‘it generally positions shared leadership as deriving from an undifferentiated set of members and assumes convergence of attitudes among team members’ (Zhu et al., 2018, p. 841). Moreover, most studies on shared leadership focus on teams, whereas our study involved teachers from the same school, but not necessarily a particular set of teachers that form a stable team. This is an important restriction when interpreting our results. Teachers often collaborate with colleagues who teach the same age group or subject, creating many small teams in a school. Since we did not survey all teachers from each school, we cannot determine whether these small teams differ in their experiences of shared leadership. An additional possible explanation for the lack of a link between *shared constructive leadership* and interaction quality is that shared leadership might be more volatile than vertical leadership. Shared leadership may evolve in a dynamic process with multiple potential sources (Drescher et al., 2014) which may be best be captured through daily assessments.

Contrary to expectations, we found no relationship between *shared constructive leadership* and teachers’ daily work-engagement and affective states. This finding contrasts with existing research, which has shown that shared leadership is related to team members’ well-being (Zhu et al., 2018). Most studies to date have linked shared leadership with team outcomes, particularly team performance, rather than individual outcomes. Possibly, shared leadership is more important for task-related outcomes than for well-being. A recent study on leadership training supports this idea: increases in vertical leaders’ transformational leadership were associated with job satisfaction while increases in shared transformational leadership were related to efficiency (Tafvelin et al., 2019). Additionally, research suggests that the relationship between shared leadership and outcomes is particularly strong when work tasks are performed interdependently (D. Wang et al., 2014). This is less characteristic of teacher work (Scheerens, 2012).

Strengths, limitations, and future research

A clear strength of this study lies in its micro-longitudinal design, which combined a survey with two daily measurement occasions, repeated over 10 working days. This approach allowed us to get close to teachers’ daily experiences and minimize retrospective bias (Bolger et al., 2003). In addition, we analyzed more than one source of leadership, as recommended by scholars in the field (Yammarino et al., 2012; Zhu et al., 2018). With the distinction between vertical and shared leadership we drew upon established concepts. We also focused on all interactions at work that lasted a minimum of 10 minutes or were deemed highly important, to determine how perceived leadership influences them and how they relate to daily outcomes.

However, several limitations must be acknowledged. First, our study was based only on a small sample of schools, limiting statistical power and preventing the calculation of three-level models. Our estimation of the ICCs for the leadership variables is based on a two-level model (72 teachers within 15 schools). Simulation studies indicate a downward bias in the estimation of level-2-variance with a small number of clusters (McNeish & Stapleton, 2016). To ensure the accuracy of our analyses, we controlled for the clustering in the data and backed up our results by calculating fixed effect models. Second, due to the high participant burden of repeated assessments, our sample was a convenience sample and therefore not representative of the target population.

However, our methodology provided higher quality data of experiences in daily work life than a retrospective survey. Third, we relied on self-reports, which can introduce common *source* bias and inflate relationships between variables. However, measures of leadership and teachers' daily experiences were assessed at different points in time. Moreover, the generated variables are not overly correlated and differential effects exist. Therefore, we conclude that common source bias is not a significant issue.

Regarding the assessment of shared leadership, it would be beneficial to study teacher cooperation in schools and the extent to which established structures and processes support this cooperation. If teams are established, shared leadership should be studied within these teams and connected to team-level outcomes.

Given the limited interaction between teachers and principals found in this study, future micro-longitudinal studies should record *all* interactions with the principal, regardless of duration, including meetings, to better understand how leaders influence a positive working environment. Combining teacher assessments with more extensive evaluations of principals' practice, such as end-of-day logs (Sebastian et al., 2018), could be fruitful. Additionally, examining longer time spans or repeating the measurement period at a later time (i.e. two measurement bursts) could corroborate our comparably short-term findings of how *vertical constructive leadership* improves collaboration and creates a positive school climate, evidenced by high-quality social interactions at work. Finally, including 'destructive' leadership behaviors, i.e. those with ill intentions, in the assessment of vertical and shared leadership would be valuable, as these are negatively related to follower outcomes (Mackey et al., 2021).

Conclusions

Our study highlights the importance of *vertical constructive leadership* in schools. Teachers who perceive their principals as demonstrating constructive leadership behaviors report more productive and satisfying interactions, more pleasant affect, and higher work engagement in their daily work lives. The effect of *vertical constructive leadership* on pleasant affect is mediated by the experience of quality interactions. This is particularly relevant, given the challenges teachers face every day, such as high workload or student misbehavior, which can lead to symptoms of strain (Hakanen et al., 2006). Moreover, teachers' work-related attitudes and affective states are linked to student achievement (Tadić et al., 2013) and classroom performance (Bakker & Bal, 2010).

To ensure a positive learning environment for students and a good place to work for teachers, schools must strive for an organizational climate and resources that help teachers deal with day-to-day challenges (Simbula, 2010). *Vertical constructive leadership* and supportive collegial relationships are such resources. Principals who lead effectively – acting as role models, building shared vision and values, communicating effectively, and fostering collaboration and positive relationships among staff – are therefore highly valuable for any school (Daniëls et al., 2019; Tan et al., 2020). This also highlights the need for leadership development focused on constructive behaviors, as measured in this study, given the growing evidence of their positive outcomes for staff members (Daniëls et al., 2019).

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Ethical approval

The study was approved by the ethics committee of the Bern University of Teacher Education (PHBern); reference number 13 s 004 01.

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