Implicit Person Theory and Feedback Environment Interact to Shape Undergraduate Research Relationships

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ABSTRACT. We examined undergraduate researchers’ perceptions of the malleability of human traits and aspects of these students’ relationships with their faculty research mentors. Undergraduate research students (N = 94) completed an online survey to capture their chronic implicit person theory, perceived feedback environment with their faculty research mentor, and whether they planned to continue research collaboration in the future. We observed no significant direct relationship between implicit person theory and trust. However, students’ perceptions of the feedback environment significantly moderated the relationship between a positive feedback environment and students’ intention to continue collaboration with the faculty member, F(3, 88) = 15.88, R² = .35, p < .001. This suggests that students perceiving a positive feedback environment will be more likely than students perceiving a negative feedback environment to continue collaboration with their faculty research advisor. We discuss future research ideas that should capture data from both students and their faculty research advisors to understand this relationship more holistically.

In a perfect world, individuals aspire to perform at their highest possible level while at school or at work. Unfortunately, there are instances in which people do not live up to their own standards or the standards of their evaluators. For example, one may have a positive self-assessment of one’s own performance, but another person may have a negative assessment of the performance. When these negative views are shared, the feedback recipient often interprets the feedback as an ego threat, resulting in feedback losing its value (O’Malley & Gregory, 2011). The current research sought to understand how undergraduate researchers perceive feedback in the context of their relationship with their research mentors, as well as how it relates to the general level of trust students have for their mentors and whether they intend to continue collaboration in the future. Although previous research has investigated feedback perceptions between a supervisor and a subordinate (Whitaker & Levy, 2012), there is a gap in the research examining these relationships in a collaborative academic environment. In our attempt to explore this gap, we applied the framework of implicit person theory.

Implicit Person Theory and Feedback

Dweck’s work on adaptive and maladaptive motivational patterns identified two fundamentally different ways of conceptualizing intelligence. Although these patterns do not reflect differences in actual intellectual ability, they have powerful implications for achievement behavior (Dweck, 1986). The first pattern is incremental theory; an incremental theorist believes that an individual’s performance can change over time. The other pattern is entity theory; an entity theorist believes that an individual’s performance cannot change.
over time (Dweck & Leggett, 1988). Although an individual may be identified as being either an incremental or entity theorist, implicit person theory is a continuous variable such that individuals may lean toward one end of the spectrum, as opposed to being positioned at one pole (Levy, Stroessner, & Dweck, 1998).

Implicit person theory has been applied in both academic and applied settings. African American students who were trained to adopt an incremental theory through participating in sessions about malleability of intelligence created lasting beneficial change in their perceptions of their own intelligence (Aronson, Fried, & Good, 2002). These students also reported more enjoyment from academics and earned higher grades than the control group. In a separate investigation, Rattan, Good, and Dweck (2011) applied implicit person theory to individuals’ perceptions of math intelligence in a series of five studies. Participants were asked about their own math intelligence, and whether that ability is fixed. Next, participants were asked to imagine themselves as a seventh grade math teacher. Participants who rated their math ability as fixed criticized students’ math intelligence rather than their effort. In the second study, Rattan and colleagues observed that entity participants were more likely to use comforting techniques when compared to incremental participants. Comforting techniques included telling participants that the teacher knew that they are not good at math. Thus, the teacher would go easy on the participants during math class by asking easier questions and avoiding calling on the participant. In other words, entity participants were unlikely to create a context for performance improvement. Taken together, these findings are indicative of the openness to and perceived potential for skill development that characterize an incremental mindset.

Incremental mindsets are also associated with perceived trust in relationship partners, even in short-term interaction contexts. Participants primed to have an incremental mindset were significantly more likely to trust their partners in an online game (Haselhuhn, Schweitzer, & Wood, 2010). Participants had a chance to double their money if they passed to their partners; the partners could then either keep the money or pass half back to the participants. As a test of trust for their partners, multiple trials were completed so that the partners could betray the participants at least once. After a few trials, the participants received a message from the partners saying that they were sorry and could be trusted in the future. Incremental participants were able to move past the breach of trust and trust their partners again after the apology, as opposed to entity participants who were less likely to trust their partners after the breach of trust. Although the current study did not investigate breaches of trust specifically, trust is important for a successful mentoring relationship (Gregory & Levy, 2011). Drawing from Haselhuhn and colleagues (2010), we anticipated that incremental participants would report higher levels of trust in their faculty research advisors (Hypothesis 1).

Feedback Environment

Second, we sought to examine how implicit person theory moderates the relationship between undergraduate research students’ perceptions of the feedback environment and our outcomes of interest: trust and intent to continue in the research relationship. Ideally, feedback is an ongoing process between individuals in learning environments. Although there are typically formal performance evaluations set to take place at specific times, feedback exchanges ought to occur on a more frequent, informal basis. The feedback environment construct differs from traditional performance appraisal in that it deals with the day-to-day interactions between individuals giving and receiving feedback. Steelman, Levy, and Snell (2004) developed the Feedback Environment Scale in order to capture this feedback context, and found that feedback-seeking behavior was strongly correlated with a positive feedback environment. This suggests that individuals will be more likely to seek feedback from their supervisors if the supervisors promote feedback-seeking behaviors. We sought to address how modeling a positive feedback environment could be applied to an undergraduate research lab setting. Positive feedback environments refer to feedback environments in which students score highly on the Feedback Environment Scale (Steelman et al., 2004). This would suggest that students perceive both favorable and unfavorable feedback, readily available feedback, quality feedback, that the feedback is delivered appropriately, and that their research mentors are a credible source for feedback.

Feedback environment has been associated with important organizational outcomes, similar to those used in an academic context as explored in the current study. Anseel and Lieve (2007) found a positive correlation between a positive feedback environment and job satisfaction. High levels of
satisfaction should elicit intent to continue collaboration with the same faculty research advisor. Because Anseel and Lievens (2007) reflected the perceptions of government employees, it supports the current study’s purpose of examining the relationship between feedback environment and intent to continue collaboration in an academic context. In an organizational context, turnover intentions are similar to intentions to continue collaboration in an academic setting. Those experiencing a positive feedback environment are unlikely to have intentions of quitting their current job (Sparr & Sonnentag, 2008). Further, both the quality of feedback and favorable feedback subscales of the feedback environment scale (Steelman et al., 2004) were negatively related to turnover intentions in nurses (Van Waeyenberge, Decramer, & Anseel, 2015), accountants (Dalton, Davis, & Viator, 2015), and across multiple industries (Sparr & Sonnentag, 2008). This body of evidence serves as the basis for our prediction that there is a positive relationship between feedback environment and intent to continue the working relationship with a faculty research advisor. Thus, we predicted that research students who perceived more positive feedback environments would be more likely to intend to continue collaboration with their research mentor (Hypothesis 2).

In another study, Hartmann and Slapničar (2009) focused their attention to formal performance feedback and trust. Their analysis contributed to the understanding of the relationship between feedback and trust, such that the formality of the feedback was instrumental for levels of reported trust, mediated by the perceived quality of the feedback. Further, this relationship has been expanded upon such that useful feedback mediated the relationship between formal performance appraisal and perceived trust for one’s supervisor (Sari, Anugerah, Yusralaini, & Gusrikan, 2013). The claims made by Hartmann and Slapničar (2009) and Sari and colleagues (2013) reflected the need for an investigation of the relationship between a more informal feedback environment and trust. This relationship between formality of performance feedback and trust was mediated by the quality of the feedback (Hartmann & Slapničar, 2009). Thus, it can be speculated that the same level of trust would be reported from students if they perceived high-quality feedback from their faculty research mentors, independent of the formality of the performance feedback.

In an organizational context, professional coaching is similar to the academic mentoring relationship examined in the current study. Both feedback environment and trust have been positively associated with perceived quality of coaching relationships (Gregory & Levy, 2011). This suggests that general trust for one’s academic mentor should be related to the dyad’s positive feedback environment. Further, it can be postulated that, if feedback environment contributes to a positive coaching relationship, feedback environment should contribute to participants’ desire to continue collaborating with their mentors.

Drawing from the abundance of work on the learning benefits afforded by an incremental mindset (Burnette, O’Boyle, VanEpps, Pollack, & Finkel, 2013), we anticipated that students who possessed incremental mindsets would be particularly likely to thrive in positive feedback environments and thus would report high levels of trust and intent to continue conducting research with their undergraduate research advisors. Thus, we hypothesized that research students who experienced positive feedback environments and had incremental mindsets would report highest levels of trust for their faculty research mentors (Hypothesis 3). Also, we predicted that research students who experienced positive feedback environments and had incremental mindsets would be most likely to intend to continue collaboration with their faculty research mentors (Hypothesis 4).

Method

Participants and Procedure
Participants were undergraduate students enrolled at a private, midwestern university who had recently or were currently conducting research with a faculty research advisor. Before conducting the study, approval was given by Butler University’s institutional review board. Participants were recruited via e-mail; their research areas spanned the social and natural sciences, humanities, and pharmacy. Initially, 115 participants were recruited to participate in the study. However, 94 students (73.4% women) completed the entire survey. The 21 participants who did not complete the survey were removed from the data set and not included in the multivariate analyses. Respondents were 87.2% White, 1.1% Black, 5.3% Asian, 4.3% Hispanic, and 2.2% of the sample did not respond. Participants were an average 21.65 years of age with a standard deviation of 2.35.

Participants were informed that the study was intended to measure whether people change and
explore their experiences as an undergraduate researcher. Once giving consent to participate, participants completed a short online survey. After agreeing to participate in the study, participants were given, on subsequent online pages, the implicit person theory measure, trust measure, and feedback environment scale. Next, participants were presented with a demographic questionnaire including age, sex, race, and disciplinary affiliation. Lastly, participants were asked to indicate their intent to continue collaboration via the question mentioned below in the measures section. After completing the questionnaires, participants were presented with a debriefing form.

The following section details the scales presented to each participants. All reliability coefficients presented are unique to the current study and calculated using the data collected in this study.

**Measures**

**Chronic implicit person theory.** Participants completed a 3-item Implicit Person Theory Measure to capture their chronic implicit person theory (Levy et al., 1998). Participants indicated how much they agreed (1 = strongly agree, 6 = strongly disagree) with statements about the malleability of individuals (α = .89). An example item is: “The kind of person someone is, is something basic about them, and it can’t be changed very much.” Consistent with Levy and colleagues. (1998), participants answering a 1 to this question were associated with an entity mindset, and participants answering a 6 to this item were associated with an incremental mindset.

**Trust.** Mayer and Gavin’s (2005) 5-item scale to measure trust was administered (α = .54). Example items from this scale include: “If someone questioned my faculty research advisor’s motives, I would give him/her the benefit of the doubt,” “If I had my way, I wouldn’t let my faculty research advisor have any influence over issues that are important to me (R),” and “I would be comfortable giving my faculty research advisor responsibility for a task or problem which was critical to me, even if I could not monitor his/her actions.” Participants responded on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

**Feedback environment.** All feedback environment measures came from Steelman and colleagues’ (2004) Feedback Environment Scale (α = .98). Rosen, Levy, & Hall (2009) reported a similar internal consistency measure (α = .94–.95). We included six subscales from the Feedback Environment Scale in our analysis: source credibility, feedback quality, feedback delivery, favorable feedback, unfavorable feedback, and feedback availability. Each subscale measured a different facet of the feedback environment between a student and a faculty research mentor. Thus, items were amended to evaluate each student’s relationship with a faculty research mentor instead of with a supervisor, as originally intended by the scale. Participants indicated their agreement on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree).

During data analysis, participants’ scores on the six subscales were aggregated to create an overall feedback environment score; this score was used in the analyses discussed in the results. Aggregating the subscales of the Feedback Environment Scale has been practiced in previous research (Rosen et al., 2009). An example of an item measuring the source credibility is: “My faculty research advisor is generally familiar with my performance,” feedback quality: “My faculty research advisor gives me useful feedback about my performance,” feedback delivery: “My faculty research advisor is supportive when giving feedback about my performance,” favorable feedback: “When I do a good job on my work, my faculty research advisor praises my performance,” unfavorable feedback: “On those occasions when I make a mistake, my faculty research advisor tells me,” and feedback availability: “When I do a good job on my work, my faculty research advisor praises my performance.”

**Intent.** Participants indicated on a 7-point Likert-type scale (1 = strongly agree, 7 = strongly disagree) their level of intent to continue collaboration with their faculty research advisor. The item presented to participants was “I intend to continue working with this faculty research mentor.” This variable was treated as continuous such that participants who marked “strongly agree” intended to continue collaboration with their faculty research advisor, participants who marked “4” on the scale were considered neutral, and participants who marked “strongly disagree” intended to leave their faculty research advisor.

**Results**

Table 1 shows the means, standard deviations, and correlations among study variables. The implicit person theory measure captured where participants fell on a continuous scale in regard to their chronic implicit person theory. Scores on the 3-item measure were averaged to achieve a combined implicit person theory score. Scores of 3.0 or below reflected entity; scores of 4.0 or
above reflected incremental. If participants’ scores fell between 3.0 and 4.0, they were considered to be neither entity nor incremental (Levy et al., 1998). The average participant was considered neither incremental nor entity ($M = 3.46, SD = 1.03$). Thirty participants (31.9%) scored above a 4.0, indicating an incremental mindset. Twenty-seven participants (28.7%) scored between 3 and 4, indicating no distinct chronic implicit theory. Thirty-seven participants (39.4%) scored between 1 and 3, indicating an entity mindset.

Hypotheses were tested via linear regression. The first hypothesis was not supported; incremental mindset was not significantly associated with students’ reported trust in their research mentors, $B = 0.06, F(1, 92) = 0.77 R^2 = .01, p = .38$.

However, the second hypothesis was confirmed such that feedback environment significantly predicted intent to continue collaboration with research advisor, $B = -1.45, F(1, 90) = 38.52, R^2 = .30, p < .001$. Lower scores indicate greater intent to continue collaboration, and thus undergraduate students who perceived positive feedback environments were more likely to intend to continue collaboration with their faculty research mentors.

The third and fourth hypotheses tested for moderator effects. The third hypothesis was confirmed in that additional variance in trust is explained when testing for an interaction between feedback environment and implicit theory on trust, $F(3, 90) = 4.45, R^2 = .47, p = .04$ (see Table 2). Figure 1 shows the interaction between implicit person theory and feedback environment when trust is the dependent variable. As predicted, students who experienced positive feedback environments and had incremental mindsets reported the highest levels of trust in their faculty research advisors. This interaction should be viewed with caution due to the low reliability of the trust scores ($\alpha = .54$).

Our test of the fourth hypothesis revealed that an additional 5.1% of the variance in intent to continue collaboration was accounted for when testing for an interaction between feedback environment and implicit theory on intent to continue collaboration, $F(3, 88) = 15.88, R^2 = .35, p < .001$ (see Table 3). Again, scoring low on intent implies that participants intended to continue collaboration. Figure 2 displays the interaction between implicit person theory and feedback environment when intent to continue collaboration is the dependent variable. Although we predicted that research students who experienced positive feedback environments and had incremental mindsets would be most likely to continue collaboration with their faculty research advisors, this interaction shows that participants with entity mindsets were more sensitive to the feedback environments in terms of their intent to continue collaboration. These findings have theoretical implications as well as practical implications for those in academic research relationships.

**Discussion**

We sought to better understand students’ perceptions, particularly trustworthiness, of their faculty research advisors, and the relationship between

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**TABLE 1**

<table>
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<tr>
<th>Predictor</th>
<th>Reliability</th>
<th>M</th>
<th>SD</th>
<th>a</th>
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<th>2</th>
<th>3</th>
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<td>1.06</td>
<td>.89</td>
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<td></td>
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<td>.98</td>
<td>.00</td>
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<td>.54</td>
<td>.09</td>
<td>.66</td>
<td></td>
</tr>
<tr>
<td>4. Intent</td>
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<td>2.13</td>
<td>1.71</td>
<td>-.11</td>
<td>-.55</td>
<td>-.54</td>
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</tbody>
</table>

**Note.** *p < .05. IPT = Implicit Person Theory. High IPT = Incremental. Low Intent = intent to continue collaboration.*

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**TABLE 2**

<table>
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<th>Model 2</th>
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<tr>
<td>FE</td>
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**Note.** IPT and FE were centered at their means. IPT = Implicit Person Theory. FE = Feedback Environment. *p < .05. **p < .01.

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**TABLE 3**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
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<td>SE $\beta$</td>
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<tr>
<td>FE</td>
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<td>-.17</td>
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<td>IPT x FE</td>
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<tr>
<td>$R^2$</td>
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<td>F for change in $R^2$</td>
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<td>5.57</td>
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**Note.** IPT and FE were centered at their means. IPT = Implicit Person Theory. FE = Feedback Environment. *p < .05. **p < .01. Low Intent = intent to continue collaboration.
feedback environment and students’ intent to continue collaboration with their faculty research mentors. We hypothesized that students’ chronic implicit person theory and feedback environment perceptions would shape their undergraduate research relationships, specifically trust perceptions and intent to continue research collaboration.

Contrary to expectations, we did not observe a direct effect of implicit person theory on trust for one’s faculty research advisor. These results were surprising, as Katz (2014) found that incremental mindsets were significantly positively correlated with high levels of trust during informal feedback scenarios. On the other hand, feedback environment significantly predicted one’s intent to continue working with a faculty research advisor. Consistent with Dahling, Chau, and O’Malley’s (2012) findings that individuals consistently seek feedback from perceived positive and open feedback environments, the current research took this further, indicating that open feedback environments encourage continued collaboration. It can be speculated that, because there is continuous feedback, students are able to improve their work at a continuous pace as opposed to waiting for formal feedback scenarios. Although we presented significant findings, there were clear limitations to our study, which create research questions to be studied in the future.

We also observed two significant interactions. First, incremental participants were more sensitive to changes in the feedback environment in terms of trust for their faculty research advisor. This suggests that entity theorists’ level of trust does not vary across different levels of the feedback environment as much as incremental theorists’. Second, entity participants were more sensitive to changes in the feedback environment in terms of intent to continue collaboration. Unlike the first interaction, entity theorists experience a greater benefit to having a positive feedback environment. Although there are differences between incremental and entity participants, all participants seem to have benefitted from a positive feedback environment.

**Limitations and Future Research**

First, it is necessary to explore possible reasons for the low reliability of Mayer & Gavin’s (2005) trust scores in this study. Although this trust scale is commonly used throughout the literature, often with an acceptable reliability estimate (Colquitt & Rodell, 2011 report $\alpha = .82–.84$), reliability estimates are unique to each use of the scale. There are a few reasons why this often-reliable scale was not reliable in the current study. First, the scale was modified from its original form to be used with a student sample. When created by Mayer & Gavin, the scale was intended to assess trust from an organizational sample. When transposing the scale from its original form, we attempted to maintain the original structure of the items. However, it is possible that this transformation impacted the scale. Second, it is possible that the low internal consistency of the trust measure was because the
5-item measure contained two negatively worded items. Having negatively worded items can cause psychometric problems (Barnette, 2000). However, given the abundant use of Mayer & Gavin’s (2005) trust measure, we did not anticipate internal consistency issues.

Because a portion of our sample were undergraduate seniors, unlikely able to continue the professional relationship after graduation, there was concern over whether our question measuring intent to continue collaboration is an appropriate measure in this context. At the undergraduate institution where this study took place, it is fairly common for research and collaboration to continue until or, in some cases, beyond graduation. Also, a number of undergraduate juniors, as well as students in professional programs (which extend beyond the traditional 4-year college structure) participated in this study. Although we believe that our intent question was adequate for the purpose of this study, future research should employ a deeper exploration of intent to continue collaboration. For example, capturing why participants may intend or not intend to continue collaboration would be valuable to this line of research.

Although participants in this study were completing research in a variety of fields, they all attended the same university. Some universities place greater emphasis on undergraduate research than others. For that reason, the external validity of the findings that a positive feedback environment will predict intentions for continued collaboration needs evaluation. At an institution in which there is less emphasis put on the importance of undergraduate research, students may be motivated by different individual differences to continue collaboration. For example, at institutions with a graduate psychology program, professors may put most of their effort into producing publications and other work. On the other hand, professors at other universities without a graduate program may be motivated to allow undergraduates to play a pivotal role in the research process. Because of this, it is possible that they spend more time focusing on feedback and fostering the academic development and growth of their students. Thus, we suggest replication of this study or a similar study at different universities across a number of countries to determine the generalizability of the presented results.

To get a more in-depth understanding of the real interaction between a student and faculty research mentor, it would be beneficial to measure the perceptions of the faculty research advisor. We were unable to survey the faculty research advisor that each participant was collaborating with. Given this limitation, the next step in this line of research should inquire more about the faculty research advisor.

Past researchers asked participants to rate the implicit person theory of their supervisor (Kam, Risavy, Perunovic, & Plant, 2014; Jenssen, 2014). Kam and colleagues (2014) operationalized the perception of someone else’s implicit theory as whether the supervisor would notice performance change. They found that an employee’s implicit theory had no correlation with their supervisors’ perceived implicit theory. Kam and colleagues (2014) found that participants who perceived their supervisors to have an incremental implicit person theory were unlikely to indicate turnover intention. In an academic context, this is similar to measuring students’ intentions to continue collaboration. Similar to the findings in the present study, Kam and colleagues (2014) found no correlation between employees’ chronic implicit person theory and turnover intentions. In an academic environment, it could be beneficial to capture perceived implicit person theory score of the faculty research advisor to see if there is a similar effect.

Another construct that could be introduced to better understand research relationships is procedural justice, the level of perceived fairness in the decision-making process. Heslin and VandeWalle (2009) found that an individual’s implicit person theory score affects perceived procedural justice such that incremental participants experienced more positive procedural justice. It would be beneficial to understand the role that feedback environment plays in perceptions of procedural justice. Because Heslin and VandeWalle (2009) focused on procedural justice in formal performance evaluation scenarios, perceptions could differ based on one’s feedback environment. Given that feedback environment involves continuous feedback, participants would have more instances to form impressions of procedural justice.

Conclusion

Our research extended the feedback literature beyond applied organizational settings into undergraduate research relationships. Feedback environment plays a pivotal role in the relationships that undergraduate researchers have with their faculty research advisors. If students perceived their faculty research advisors to be familiar with their work, available to give feedback, and respectful in
their delivery, this indicates a positive feedback environment (Steelman et al., 2004). In light of these results, we believe that fostering a positive feedback environment is instrumental in ensuring high-quality relationships between undergraduate researchers and their research advisors.

References


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