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Temporal Aspects of Mimicry and Costs of Mimicry: The Link Between Mimicry, Its Duration, and Self-Esteem of The Mimickee

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Supplementary Materials: Code, Data, Materials, Preregistration [see Index of Supplementary Materials]

Abstract

Experiments that manipulate the presence of mimicry generally find that mimicry benefits the mimicker. These results led to the "mimicry-as-a-social-glue" hypothesis, which considers mimicry as a mechanism responsible for starting and maintaining social relations. There are two novel aspects in the present pre-registered experiment. First, the experiment examines temporal aspects by including four conditions: no mimicry, mimicry during the first five minutes, the last five minutes, or mimicry present throughout the interaction. By doing so, we contribute to ongoing efforts to standardise mimicry methodology. Second, this explores the underexplored issue of potential costs associated with mimicry and challenges the "mimicry-as-a-social-glue" hypothesis. The results demonstrate a relationship between temporal factors and the effects of mimicry. Participants who were mimicked during the final five minutes of the interaction reported significantly lower self-esteem compared to those mimicked during the initial five minutes. However, no significant differences in self-esteem were found between the no mimicry condition and mimicry during the first five minutes, nor between the final five minutes condition and mimicry sustained throughout the entire interaction. Similarly, no significant differences were observed between the no mimicry condition and the condition in which mimicry was sustained for the entire interaction. These findings suggest that the costs and benefits associated with mimicry depend on its temporal dynamics.

Keywords

Mimicry, Chameleon Effect, Imitation, Temporal Aspects of Mimicry, Self-Esteem, Costs of Mimicry

Highlights

- This study tested whether mimicked individuals report lower self-esteem than non-mimicked ones.
- The study also tested if the influence of mimicry on self-esteem depends on its temporal aspects (no mimicry, mimicry through the first 5 minutes, mimicry through the last 5 minutes, or mimicry through the whole interaction).
- Participants mimicked during the last five minutes of interaction reported significantly lower self-esteem compared to those mimicked during the first five minutes.
- These results challenge the "mimicry-as-a-social-glue" hypothesis, showing that mimicry's effects are not universally positive and may depend on temporal dynamics.

Clinical psychologists were quick to observe that mimicry may facilitate psychotherapist-patient interaction by improving understanding and rapport (Dabbs, 1969), which are important aspects of social bonding during therapeutic sessions. Recent studies have shown that mimicry is not only responsible for smooth communication during clinical interactions (Zhou & Fischer, 2018), but also for reducing the severity of the symptoms that lead to therapeutic intervention (Ramseyer & Tschacher, 2011). It has therefore been suggested that mimicry contributes to therapeutic success (Paulick et al., 2018).

Similar to clinical settings, in the field of social psychology, research has centred around the hypothesis that mimicry is beneficial for starting and maintaining social relations. As outlined in the review below, some consider mimicry to function as "a social glue" (Dijksterhuis, 2005; Lakin et al., 2003).

The social glue hypothesis was grounded in social benefits, as proposed by Chartrand and Bargh (1999). Firstly, they showed that people with greater empathy tend to automatically mimic the interlocutor (Experiment #1 and #3). Secondly, nonverbal mimicry performed by the experimenter led to increased perception of smoothness of the interaction and liking toward the mimicker (Experiment #2). Benefits for the mimicker were then explored and it was shown that the mimicking dyad also experiences greater closeness to the external social environment (Stel & Harinck, 2011), leading to greater tips (van Baaren et al., 2003), and an increased tendency to buy more (Kulesza et al., 2014b). More recent studies in naturalistic settings have also shown that mimicry impacts the mimickee's perception of service quality provided by the mimicker (Kulesza et al., 2022) as well as the tendency to deeply trust by granting legal representation to a mimicking lawyer (Kulesza et al., 2023a).

Temporal Aspects of Mimicry

A closer look at the procedure of mimicry studies reveals that they vary on how long mimicry was employed. Different researchers used different durations to manipulate mimicry: from 11 seconds (Lakens & Stel, 2011); two, three, or five minutes (Inzlicht et al., 2012); to even fifteen minutes (Chartrand & Bargh, 1999).

There are, however, a few works that directly explored the issue of temporal aspects of mimicry. Kulesza and colleagues (2019) were the first to conduct such research in a restaurant setting. Here, customers were either mimicked by a waitress or not. The results were intriguing: mimicry led to an average tip that was twice as high as in the control group. Interestingly, even a single act of mimicry increased the propensity to tip, regardless of whether it occurred at the beginning or end of the meal and even if it only lasted a few minutes. Subsequently, a study by Kulesza et al. (2022) examined the dynamics of mimicry in the context of setting up a cable service TV. Here, technicians either mimicked (or did not mimic) clients during the installation process. This interaction with the technician, either mimicking or not mimicking, lasted for different lengths of time: five, ten or fifteen minutes. The subsequent assessment of service quality showed that even brief mimicry that lasted only five minutes significantly improved the customers' evaluation of the service.

All in all, the temporal aspects of mimicry are still largely unexplored, as only two studies have dealt with this relationship. Moreover, the conclusions drawn from these studies are primarily limited to the benefits of mimicry in the context of marketing. Thus, it is imperative to examine the temporal aspects of mimicry to provide a more grounded theoretical framework for such relationships. This paper therefore builds on these efforts and explores in a novel way the relationship between mimicry, its timing, and the potential associated costs.

Costs Stemming From Mimicry

A growing body of literature has begun to explore the potential costs of mimicry. Evidence shows that mimicry increases the propensity to deceive the mimicker (Muniak et al., 2021) and heightens feelings of guilt among those being mimicked (Muniak & Kulesza, 2024). What is especially interesting—from the perspective of the present paper—is that mimicry was also shown to lower mimickees' self-esteem and self-liking (Kot & Kulesza, 2016). However, it is important to note that Kot and Kulesza's (2016) study was not pre-registered, did not meet the standards of high-power sampling (n = 21 participants per condition), and the p-value was high (p = .036). Because of these limitations, the study requires replication as it may have yielded an overestimated effect size or even false-positive results (Gelman & Carlin, 2014; Leppink et al., 2016). The current paper fixes these methodological and statistical issues and also addresses the temporal aspects of mimicry mentioned earlier.

Goal of the Paper

As noted above, mimicry can be highly beneficial for the mimicker. However, some studies also show that the effects of mimicry are dependent on its temporal aspects, and there are potential costs. The present experiment integrates these two findings by investigating previously unexplored aspects of the relationship between the timing of mimicry and the associated costs, specifically in the context of self-esteem of those being mimicked. Exploring this relationship is important to understand the generalizability of temporal aspects of mimicry (replication of previous studies in the new area proving its generalizability), or lack thereof (temporal effects of mimicry are nuanced, and differ from each other). Finally, we achieve this goal with a pre-registered, and high-power experiment addressing the lack of these features in previous works.

The experiment was pre-registered (see Muniak, 2021). The data of this experiment are openly accessible at the Open Science Framework (OSF; see Muniak, 2022). This experiment was reviewed and approved by the ethics committee of the SWPS University of Social Sciences and Humanities in Wroclaw, Poland (08/P/03/2020). Informed consent was obtained from all participants before enrolment in the experimental procedures and data collection.

Method

Participants and Design

We aimed to recruit a sufficiently large sample to detect a medium effect of Cohen's f = 0.25 (equivalent to ε^2 = .06), with a power of 1 - β = 0.85 and an alpha probability of α = .05. An a priori power analysis using G*Power (Faul et al., 2007) revealed that 204 participants were needed to detect such an effect. This hypothesized medium effect size was based on previous research findings examining the impact of mimicry on self-esteem (Kot & Kulesza, 2016). Thus, 204 participants (104 women, 100 men, and 0 non-binary persons), with an age ranging from 18 to 77 (M_{age} = 32.74, SD_{age} = 13.29), were recruited for this study.

Participants were randomly assigned to four between-subject conditions: (no mimicry; n = 50, mimicry during the first 5 minutes of the interaction; n = 51, mimicry during the last 5 minutes of the interaction; n = 52, and mimicry during the whole interaction; n = 51). Participants did not receive any payment for their participation. No data were excluded from the analysis.

Procedure

Using Google Meet, participants connected with and were welcomed by the experimenter (female, in her early twenties). The apparent goal of the 10-minute interview was to

explore opinions on close interpersonal relationships and their impact on self-esteem. For example, the experimenter asked participants about how staying in a close interpersonal relationship can affect one's self-esteem. During the interview, manipulation of verbal mimicry was introduced, where confederates mimicked words spoken/expressed by the participants. The number of words used by the confederate was in direct proportion to the number of words used by the participant. If the participant was in the habit of repeating specific words/phrases, the confederate made sure to use them at the end of each sentence. Participants were mimicked during the whole interaction, the first 5 minutes of the interaction, or the last 5 minutes of the interaction following recommendations stemming from Kulesza and colleagues' study (2014a). In the no mimicry condition, the confederate responded to the participant simply by stating "yes" and "I understand" without mimicking the participant's words.

Following the interaction, participants completed a self-esteem questionnaire. Self-esteem was assessed using the Polish adaptation of Rosenberg's Self-Esteem Scale (Łaguna et al., 2007), comprising 10 items rated on a scale from 1 (strongly agree) to 4 (strongly disagree). Half of the items were reverse-coded, such as "I feel that I am a person of worth, at least on an equal plane with others," while the remaining items were non-reverse-coded, for example, "On the whole, I am inclined to feel that I am a failure." A mean score was computed across all items, with higher scores indicating greater levels of self-esteem (Cronbach's $\alpha = 0.89$). This self-esteem score was the key and only dependent variable in the current study. Participants also provided demographic information, including their gender and age, and subsequently took part in a debriefing session.

Results

Pre-Registered Analysis

To verify the assumptions of the main analysis, Levene's test indicated that the assumption of homogeneity of variances was met, $F(3, 200) = 1.80$, $p = .148$. However, the Shapiro-Wilk test revealed significant deviations from normality in all experimental groups (all $p \leq .022$), suggesting the use of nonparametric tests. Thus, a Kruskal-Wallis test was run to test the effect of mimicry condition on self-esteem.

The Kruskal-Wallis test revealed a significant effect of mimicry conditions on self-esteem, indicating that different mimicry conditions influenced participants' declared self-esteem ($\chi^2(3, N = 204) = 14.30$, $p = .003$, $\varepsilon^2 = .06$). Post-hoc analyses using Dunn's test with Bonferroni correction provided more specific insights.

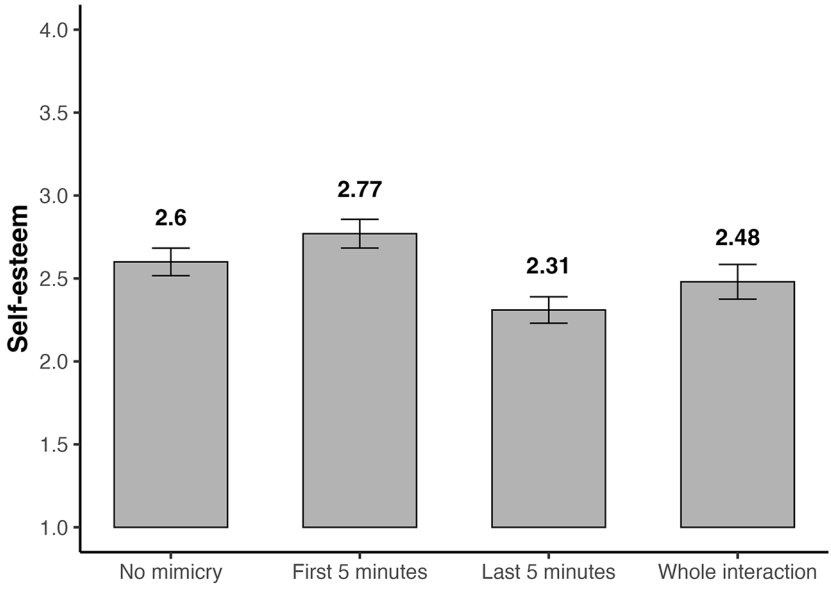
A significant difference was observed between participants mimicked during the first five minutes ($M = 2.77$, $SD = 0.62$) and those mimicked during the last five minutes ($M = 2.31$, $SD = 0.57$). This difference was statistically significant both before ($p < .001$) and after correction ($p_{adj} = .002$, $z = -3.61$, $r = .25$). Additionally, participants in the

no mimicry condition (M = 2.60, SD = 0.59) reported significantly higher self-esteem compared to those in the mimicry during the last five minutes condition, but only before correction (p = .018); this difference did not remain significant after adjustment (p_{adj} = .108, z = -2.36, r = .17). Furthermore, mimicry during the first five minutes resulted in higher self-esteem than mimicry throughout the whole interaction (M = 2.48, SD = 0.75), a difference significant before correction (p = .018) but not after correction (p_{adj} = .109, z = -2.36, r = .17).

No significant differences emerged when comparing the no mimicry condition and mimicry throughout the whole interaction (p = .259, p_{adj} = .999, z = -1.13, r = .08). Similarly, no differences were observed between the mimicry during the last five minutes condition and the mimicry throughout the whole interaction condition (p = .217, p_{adj} = .999, z = 1.24, r = .09). Lastly, self-esteem levels in the no mimicry condition and mimicry during the first five minutes condition were not significant either (p = .222, p_{adj} = .999, z = 1.22, r = .09). See Figure 1.

Figure 1

Visual Representation of Self-Esteem Across Experimental Conditions



Note. Bars represent raw group means; error bars indicate standard error of the mean (SE).

Non-Pre-Registered Bayes Factor Analysis

We conducted a series of Bayesian t-tests for independent samples using JASP software with the default prior of r = 0.707. This analysis aimed to quantify the evidence sup-

porting the alternative hypothesis (H_1), for which we report the Bayes Factor (BF_{10}). Additionally, it estimated the likelihood of our results occurring if the null hypothesis (H_0) were true, for which we report the Bayes Factor (BF_{01}).

The comparison between mimicry during the first five minutes and mimicry during the last five minutes provided a BF_{10} = 162.44, indicating "extreme" evidence for H_1 (Wagenmakers et al., 2011). Additionally, the comparison between no mimicry and mimicry during the last five minutes resulted in a BF_{10} = 3.68, showing "substantial" evidence for H_1 (Wagenmakers et al., 2011). Finally, the comparison between mimicry during the first five minutes and mimicry throughout the whole interaction yielded a BF_{10} = 1.48, which provides "anecdotal" evidence for H_1 (Wagenmakers et al., 2011).

The comparison between no mimicry and mimicry throughout the whole interaction revealed a BF_{01} = 3.42, indicating "substantial" evidence for H_0 (Wagenmakers et al., 2011). Additionally, the comparison between mimicry during the last five minutes and mimicry throughout the whole interaction showed a BF_{01} = 2.11, providing "anecdotal" evidence for H_0 (Wagenmakers et al., 2011). Lastly, the no mimicry condition and mimicry during the first five minutes resulted in a BF_{01} = 1.94, providing "anecdotal" evidence for H_0 (Wagenmakers et al., 2011).

Discussion

This experiment examined the effects of the temporal aspects of mimicry on self-esteem. It revealed notable differences based on the timing of mimicry. Specifically, mimicking participants during the final five minutes of the interaction resulted in lower self-esteem compared to mimicking them during the initial five minutes. However, no significant differences were observed between mimicry limited to the final five minutes and mimicry sustained throughout the entire interaction. Similarly, participants in the no mimicry condition did not report significantly different self-esteem compared to those in the condition where mimicry occurred during the first five minutes. Lastly, no significant differences were found between the no mimicry condition and the condition involving mimicry throughout the entire interaction.

These findings, replicated in a larger, pre-registered sample, align with the general trend reported by Kot and Kulesza (2016). In addition, the current experiment suggests that the impact of mimicry on self-esteem may depend more on its timing than on its mere presence.

Theoretical Implications

The large body of literature on mimicry typically sees it as a mechanism responsible for starting and maintaining social relationships. Thus, mimicry was coined a "social glue" (Dijksterhuis, 2005; Lakin et al., 2003). From the perspective of our results, the

"social glue" hypothesis may need to be reconsidered. After all, our results suggest that the mimicking behavior responsible for starting and maintaining social relationships can at the same time be harmful for one party of the interaction (i.e., the mimickee). Our result thus suggests that mimicry can have wider and more varied consequences beyond serving as a "social glue."

To understand these wider consequences more fully, it is crucial to examine how mimicry impacts the self-esteem of mimickees. One possible explanation is that participants in our study might have perceived mimicry as excessive in certain conditions. This idea is supported by Wessler et al. (2023), who found that too much mimicry can reduce its positive effects, emphasising the importance of using mimicry selectively and subtly.

In our study, participants in the condition where mimicry was present for that last 5 minutes had significantly lower self-esteem compared to those in the condition where mimicry was limited to the first five minutes. These negative effects in the last five minutes may arise because mimicry could make participants feel controlled or overly observed, undermining their sense of autonomy and authenticity, and causing discomfort or self-doubt. The fact that mimicry at the end of interaction was particularly impactful could be explained by the recency effect (Anderson, 1971; Murdock, 1962), where events occurring at the end shape how the entire experience is evaluated. Participants may have perceived late-stage mimicry as representative of the entire interaction, leading to increased discomfort or negative feelings.

This explanation aligns with earlier research on the costs of mimicry. Studies have shown that mimicry can lead to increased lying to the mimicker (Muniak et al., 2021), feelings of guilt (Muniak & Kulesza, 2024), and reduced self-esteem (Kot & Kulesza, 2016). Importantly, these studies, like ours, used interactions lasting about 10 minutes. This consistency suggests that 10 minutes might be the threshold at which mimicry's negative effects begin to appear. When mimicry feels excessive—whether due to its duration, intensity or timing—it may surpass the optimal level, resulting in adverse effects like reduced self-esteem.

The inverted-U theory proposed by Grant and Schwartz (2011) provides a useful framework for understanding this pattern. This theory suggests that many positive effects increase up to a certain point, but beyond that optimal threshold, their benefits decrease and can even become harmful. In the case of mimicry, brief and well-timed instances can lead to positive outcomes, such as increased tipping (Kulesza et al., 2019) or improved marketing effectiveness (Kulesza et al., 2022). Our findings can be reconciled with this framework, as mimicry during the first five minutes of an interaction did not negatively affect self-esteem. However, note that we found no significant increase in self-esteem as a function of the initial mimicry as compared to the no mimicry (control) condition.

In summary, these findings challenge the assumption that mimicry always acts as a "social glue." While it can strengthen social bonds in shorter interactions or when

used early, prolonged or excessive mimicry may lead to relational costs. Future research should explore the conditions under which mimicry enhances relationships and the circumstances where it leads to unintended costs.

Methodological Implications

As noted in the introduction, recent research has shown that even brief instances of mimicry can yield significant positive outcomes, such as increased tipping (Kulesza et al., 2019) or enhanced marketing effectiveness (Kulesza et al., 2022). However, it is important to distinguish these findings from the present study. While prior research has primarily focused on the benefits of mimicry, often examining single acts or early implementation of mimicry during an interaction (Kulesza et al., 2019, 2022), our study investigated the potential costs of mimicry. Specifically, we explored adverse effects, such as lower self-esteem, which, due to our interpretation, are more likely to arise in prolonged interactions—particularly during the final stages of a 10-minute interaction.

This distinction highlights the critical role of timing in mimicry's effects. It appears that while its benefits are more likely to emerge early, its costs tend to manifest later. Moreover, our findings, consistent with prior research on mimicry's potential drawbacks (Kot & Kulesza, 2016; Muniak et al., 2021; Muniak & Kulesza, 2024), suggest that negative effects require extended interactions—approximately 10 minutes—to become evident. Methodologically, this implies that studying mimicry's benefits can be accomplished through brief and less resource-intensive experiments, whereas investigating its costs necessitates longer and more resource-intensive designs.

Limitations and Future Directions

While mimicry is inherently a social phenomenon that can be most authentically observed in face-to-face interactions, the experimenter in our study contacted participants online. This undeniably robbed the interaction of its immediate, face-to-face nature. Nevertheless, our method is supported by the literature. For example, a recent study by Kulesza et al. (2023b) used a similar interaction method and achieved similar results, thus proving it to be an effective method for manipulating verbal mimicry.

In the same vein, our investigation was limited to verbal mimicry. This raises the question of whether comparable results could be observed in other domains, such as nonverbal mimicry or facial expressions of emotions, and whether such research might show its generalisability.

Another important issue to highlight is that the current data leave open whether late mimicry decreases self-esteem or whether early or no mimicry boosts it. We can only confirm that participants' self-esteem was significantly lower in the late mimicry condition compared to early mimicry condition. Both conditions were not significantly different from the control (no mimicry). To better understand this effect, future studies

should use a repeated-measures design, measuring self-esteem both before and after the social interaction. Additionally, introducing conditions where the experimenter is responsive without mimicking, or where self-esteem is measured without any social interaction, would help establish a clearer baseline for comparisons.

A further issue that warrants discussion is whether the topic of conversation we selected (opinions on close interpersonal relationships and their impact on self-esteem), during which we implemented the mimicry manipulation, could have influenced our results. In our interpretation, this scenario is unlikely. It is worth noting that Kot and Kulesza (2016) were the first to examine the effect of mimicry on mimickees' self-esteem, finding that participants who were mimicked reported lower self-esteem compared to those not being mimicked. This finding aligns with our results, demonstrating a replication of the general trend. Crucially, in Kot and Kulesza's (2016) study, the mimicry manipulation occurred as the experimenter mimicked participants while they described photos, following a procedure directly derived from the seminal work on mimicry by Chartrand and Bargh (1999).

Therefore, considering that we obtained similar results to Kot and Kulesza (2016) despite the different contexts in which the mimicry manipulation was introduced, we believe the chosen conversation topic did not play a key role in the outcomes. Future studies should investigate the content of what was said during the conversation. This is important to examine because of the possibility that the negative or positive effects of mimicry may have to do with repeating a particular piece of the conversation (e.g., the conversation could be more positive in the beginning and more negative at the end).

Conclusion

The aim of this study was to examine how the effects of mimicry on self-esteem are shaped by its temporal aspects. While the "mimicry-as-a-social-glue" hypothesis proposes that mimicry universally enhances social bonds, our findings suggest a more complex relationship influenced by timing. Specifically, participants mimicked during the last five minutes of an interaction reported significantly lower self-esteem compared to those mimicked during the first five minutes. However, no significant differences were observed between mimicry during the final five minutes and mimicry sustained throughout the entire interaction. A similar pattern emerged when comparing the no mimicry condition with mimicry during the first five minutes. Additionally, no significant differences in self-esteem were found between participants in the no mimicry condition and those mimicked throughout the entire interaction.

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Author Contributions: *Karolina Hipsz*—Conceptualization | Methodology | Investigation | Resources | Data curation. *Paweł Muniak*—Formal analysis | Writing – original draft | Writing – review & editing | Visualization. *Dariusz Doliński*—Supervision | Writing – original draft | Writing – review & editing. *Wojciech Kulesza*—Conceptualization | Methodology | Investigation | Writing – original draft | Supervision | Project administration | Funding acquisition.

Ethics Statement: The study was reviewed and approved by the ethics committee of the SWPS University in Wroclaw, Poland (08/P/03/2020). Informed consent has been obtained from all respondents prior to their participation in the study.

Preregistration Statement: The study was pre-registered (see Muniak, 2021).

Data Availability: All materials, as well as databases, and statistical analysis for the experiments are available at the Open Science Framework (see Muniak, 2022).

Supplementary Materials

For this article, the following Supplementary Materials are available:

- Preregistration (see Muniak, 2021)
- All materials, as well as databases, and statistical analysis for the experiments (see Muniak, 2022)

Index of Supplementary Materials

Muniak, P. (2021). *Mimicry // self-esteem // temporal aspects* (AsPredicted #64,955) [Preregistration]. AsPredicted. https://aspredicted.org/WCH_EXK

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