



The visual moderation effect: How the representation of loyalty reward progress affects consumer judgments and behaviors

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Abstract

Across nine studies ($N=3,735$), the authors find evidence of a *visual moderation effect*, defined as the tendency for consumers to make progress estimates that are closer to the midpoint of a range (i.e., less extreme) when presented with loyalty reward progress information in a more visual format. Results indicate that when actual reward progress is displayed more visually, loyalty program (LP) members overestimate their progress when they are far from their reward but underestimate it when they are near their reward. The authors further demonstrate that this effect arises because the inherent ambiguity of more visual (vs. more numerical) representations leads consumers to feel less confident about the progress they have achieved and, consequently, to assume that they are closer to the middle of the feasible range. This visual moderation effect, which influences consumers' motivation and their propensity to undertake behaviors that would help them achieve their loyalty reward (e.g., patronizing the firm again), is robust across (1) different visual representations of progress (e.g., block bar charts, circular rings), (2) various LP contexts/categories (e.g., coffee shop, grocery store, frozen yogurt shop, car wash, restaurant), and (3) different samples (e.g., online panel participants, university students, actual customers).

Keywords Visual moderation effect · Visual display · Loyalty program · Loyalty reward progress · Visual representation · Processing of quantitative information

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Loyalty programs¹ (LPs) are prevalent in the marketplace—the most recent 2024 Bond Loyalty Report showed that households in the United States subscribe to about 19 different LPs. Furthermore, customers use their “favorite” LPs relatively often—15% of customers interact with them daily, up from 10% in 2015 (Morgan, 2020). From a firm perspective, LPs serve as strategic marketing tools that play a critical role in customer relationship management (CRM) by encouraging customer engagement (Belli et al., 2022; Bijmolt et al., 2018) and repurchasing behaviors (Watson et al., 2015). Because LPs have the potential to “influence customer purchase and redemption decisions” (Khodakarami et al., 2024, p. 1), the careful management of LPs represents a significant monetization opportunity for firms.

Yet, despite subscribing to so many LPs, consumers actively use fewer than half of them (Jones, 2024; The Bond Loyalty Report, 2024). One reason certain LPs may not be effective is that they fail to communicate loyalty reward progress information effectively, and in a way that fosters

¹ Loyalty programs are also referred to as LPs or reward programs. We use this terminology interchangeably.

consumer engagement and excitement. Indeed, consumers' top frustrations with LPs include the difficulty of tracking points and confusion surrounding the rewards redemption process (Wirecard, 2019). Furthermore, consumers may struggle to keep up with frequent LP changes, as firms' LPs are constantly evolving. In fact, 79% of companies plan to revamp their LPs within the next three years (Antavo, 2023). As a result of these factors, LP user experience has become a significant driver of consumer behavior, with 56% of consumers preferring one LP over another due to ease of use (LoyaltyOne, 2024).

Firms have responded by seeking innovative ways to communicate LP progress reward information to enhance consumer involvement and motivation, both when considering physical loyalty cards and digital loyalty apps. Digitization has created new opportunities for firms by providing LP progress information to consumers through dynamic mobile applications rather than static physical punch cards. Digital LPs, defined as LPs that are accessible through a mobile application, are outpacing traditional programs (i.e., physical cards) by a factor of five, with estimates showing upwards of 32 billion subscriptions by 2026 (Mastercard, 2023). According to the popular press, 95% of consumers want to engage with LPs using emerging technologies, and 75% say they would engage more with LPs they can easily access from a smartphone (Morgan, 2020). Furthermore, digital LPs can enrich traditional customer-firm interactions, thus enabling value creation through these experiences (Kim et al., 2021; Reinartz, 2019).

However, LP complexity remains an ongoing issue; one in three consumers finds LPs challenging to understand and use (Daily, 2023). Principles of effective game mechanics (Hofacker et al., 2016) may provide both traditional and digital LPs with ideas on how to optimally structure their procedures and rules, as well as their process for goal achievement and reward attainment. A particularly critical design choice for an LP is how to communicate reward progress to customers in a manner that accelerates repurchase rates and consequently increases firm revenues. The present research aims to provide firms with guidance as they attempt to select the optimal display format for their LP.

In response to the virtually unlimited opportunities for customization and information presentation offered by digital formats (Zhang & Wedel, 2009), many firms have adopted LP formats that emphasize visual elements (e.g., block bar charts, circular rings) for conveying quantitative information (e.g., progress toward a goal). As a result, we contend that there is now substantial heterogeneity with respect to the *display format* that LPs use to communicate reward progress information, as shown in Fig. 1 (see Web

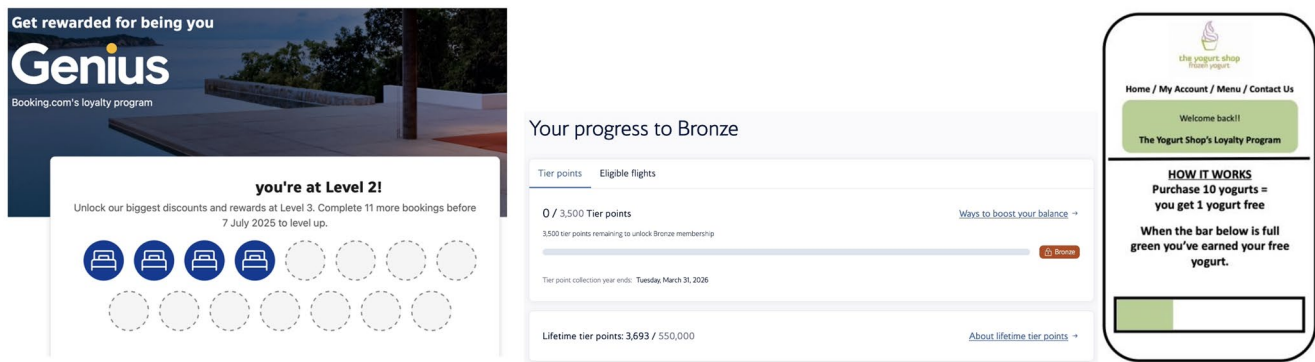
Appendix A for additional examples). While some firms opt for a relatively visual display, others may prefer a more numerical display that prominently features numerical information (e.g., “30 points out of 100”). Display format differs across firms and may vary across platforms used by the same firm (see Web Appendix B). Many firms provide consumers with both visual and numerical representations of LP progress; however, the order and salience of each display are likely to differ. Some apps provide numerical information on their landing page but include visual information in the drill-down view, or vice versa. Prior work has shown that consumers are influenced by the order and salience of frames and formats (Bagchi & Davis, 2012; Monnier & Thomas, 2022). As we will demonstrate, the display format predominantly used by a firm to represent reward progress information can be located along a continuum ranging from “visual” to “numerical.”

These complexities in information presentation motivate the following research questions: (1) How do participants exposed to LPs respond to *more visual* versus *more numerical* displays of equivalent reward progress?, (2) Under what conditions do customers perceive that they have made greater reward progress, and will this affect their motivation and subsequent LP-related behaviors?, and (3) What psychological factors underlie differences in consumers' response to these display formats?

To answer these questions, we conducted nine studies involving both between- and within-subject experimental designs. Our research uncovered consistent evidence of a phenomenon that we call the *visual moderation effect*—when consumers consider loyalty reward progress information depicted in a more visual format, they make progress estimations that are closer to the midpoint of a range (i.e., less extreme). Hence, our results indicate that when actual reward progress is presented more visually (vs. more numerically), LP members overestimate their progress in the early stages but underestimate it when they are actually closer to the reward. We further demonstrate that this effect arises because the inherent ambiguity of visual representations leads consumers to feel less confident about how much progress they have made and, consequently, to default to an estimate that is closer to the middle of the feasible range.

Taken together, this research offers both theoretically and practically important insights. First, our findings enrich the theoretical understanding of progress visualization (e.g., Cheema & Bagchi, 2011; Koo & Fishbach, 2012; Jia et al., 2023; Mousavi et al., 2024) by showing that individuals' perceptions of their reward progress and their motivation to pursue an LP reward depend on how progress information is presented. Second, extant LP research

More Visual Displays



More Numerical Displays

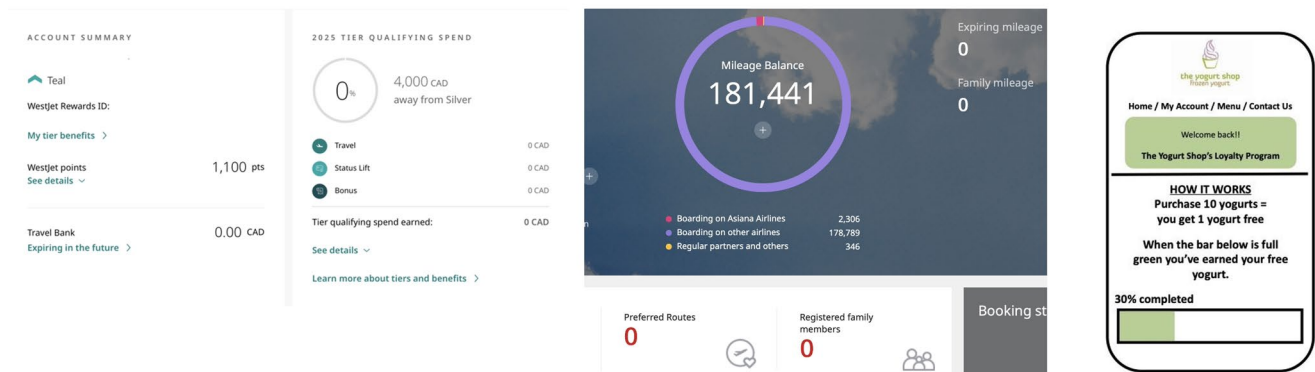


Fig. 1 Examples of different loyalty reward progress displays. Note: Sample LP displays represent 3 more visual ones and 3 more numerical ones, including from real LP programs (Booking.com, British Airways, WestJet, Asiana Airlines) and our experimental stimuli

has primarily considered how different ways of presenting numerical information (Kivetz et al., 2006; Nunes & Drèze, 2006; Bagchi & Li, 2011) affect LP progress perceptions and motivation. In contrast, we evaluate how customers exposed to LPs respond to equivalent loyalty reward progress information displayed in a more visual (vs. more numerical) format. Third, our findings provide marketers with pertinent insights applicable to loyalty programs, whether in digital formats or paper-based punch cards (e.g., Ruan et al., 2024). We show that LP customers perceive the same objective progress information differently depending on the type of display used (i.e., numerical or visual), thereby influencing their inclination and behaviors towards pursuing a reward. To increase purchase acceleration towards a loyalty reward, firms should be mindful of their customers' stage in the reward progress journey and realize that deploying a more visual display format during the early stages of their reward progress and a more numerical display format during the later stages may be most effective approach at encouraging LP customers to achieve their reward objectives. As such, we offer marketers actionable advice on how and when to strategically communicate reward progress to engage and motivate LP customers.

Visual and numerical variation in LP reward progress displays

The relevance of this research relies on there being significant variation in the display format (i.e., more visual vs. more numerical) currently adopted by LPs. We validated this by following a two-pronged approach. First, we conducted a series of 11 interviews with high-profile industry experts who have been professionally involved in the design, testing, or evaluation of loyalty programs/apps. As shown in Table 1, these experts agreed that firms differed substantially on how LP progress is displayed, and they made different predictions (or were unsure) about whether more visual or more numerical displays would be more motivating to consumers.

Second, we conducted a pre-registered Pilot Study A (<https://aspredicted.org/y4nb-23hn.pdf>) with 403 students at a large public university in the U.S. (61.3% female; $M_{\text{age}} = 20.10$, $SD = 1.96$), who participated in exchange for course credit. Participants were informed that many firms design loyalty apps for customers to record purchases and track progress towards goals or loyalty rewards (e.g., free products). They learned that firms use visual and numerical

Table 1 Findings from interviews with loyalty industry experts

Title of interviewee	Industry	How much variation exists in LP display formats?	Are consumers motivated by more visual or more numerical LP displays?
Senior Manager, Loyalty Membership Programs	Grocery	High Variation: <i>"There is a wide variety in terms of how [display formats] are represented. I see visual, numerical, or a combination of formats but how much each format is emphasized varies."</i>	More Visual: <i>"I don't know, but my gut says visual [will be more motivating]. It probably depends on the context and will vary for different people, who intake information in different ways."</i>
Loyalty and Retention Marketing Consultant	Beverages, Shoes	High Variation: <i>"There's a range of formats out there. I've seen icons or medallions used to show progress, but I've also seen just the number of points you appear at the top of the screen."</i>	Unsure: <i>"I clearly don't know, but I think it may be less about the display format and more about keeping it simple. In the world of loyalty, we are always trying to simplify."</i>
Loyalty Marketing Manager	Travel, Retail	Moderate Variation: <i>"In every loyalty program that I've worked on, there is usually some sort of visual acknowledgement when you log in. But each company does it differently—there may be a navigation bar that just tells you how many points you have or there might be a progress bar splashed on the corner of the homepage."</i>	More Visual: <i>"I think visual is always going to be preferable... people resonate with the visual of seeing where they are. Digging into numbers can be more confusing for customers."</i>
Executive Vice President, Client Loyalty Solutions	Range of industries	Did Not Answer	Both: <i>"You need to dynamically excite someone about the opportunity. Showing numbers and data is important but you also need to have enticing visuals. You need to intersect and have both."</i>
Senior Vice President, Products, Pricing, & Loyalty	Financial services, Retail, Travel	Moderate Variation: <i>"Most of them try and do a combination of both visually and numerically (e.g., Aeroplan of Air Canada shows you both a circular bar and reward progress like 7/15 flights or 2000/4000 dollars. On a mobile app the number is easiest to throw as there are space limitation in terms of real estate available, but usually it's a combination of pictures and numbers."</i>	It Depends: <i>"Pictures can say a thousand words, but it needs to be very appropriate. If somebody is a very low infrequent user putting a number can be not that inspiring, so a picture of them can be much more impactful. But if it's a highly engaged customer, putting a number there would be more impactful as opposed to a picture."</i>
Director, Loyalty Consulting	Financial services, Retail, Travel, Packaged goods, Grocery, Pharma, Energy	Moderate Variation: <i>"Largely in the apps themselves there is a lot of visual representation, yet a lot of companies lately remind you how close you are from the next milestone reward like 2 stays left or 5 more to go."</i>	It Depends: <i>"For goal setting, visual representation is better. But if you look for quick action, then numeric representation is better. People tend to react more to numeric. Behavioral science says that some people tend to be more visual while others numeric, so you do need to do a bit of both."</i>
Senior Strategic Loyalty Advisor	Retail, Grocery	Did Not Answer	More Visual: <i>"The visual may be stronger. In loyalty you're giving very little actual value trying to get most motivation for little dollars."</i>
Vice President, Loyalty Services Consulting	Retail, Travel, Grocery, Automotive, Packaged goods, Financial services, Telecom	High Variation: <i>"There's definitely variability. Some programs lean heavier on numeric cues (especially in credit card or spend-based programs, e.g., 'You've earned 2,500 points this month'). Others emphasize visual storytelling -- progress rings, animated badges, 'one step away!' progress prompts, etc."</i>	It Depends: <i>"Visuals are generally more effective when users are further from their goal because they simplify complex information and make long-term goals feel achievable (e.g., a partially filled progress bar can encourage users to take small steps forward without feeling overwhelmed). Numerical updates become more motivating as users approach their goal because they provide precise information that creates urgency (e.g., 'just 5 more points' can push users to take immediate action)."</i>

Table 1 (continued)

Title of interviewee	Industry	How much variation exists in LP display formats?	Are consumers motivated by more visual or more numerical LP displays?
Principal Product Data Scientist	Packaged goods	Moderate Variation: “Sometimes, we just show consumers a visual progress bar with no numbers but where they can easily count how many purchases they have made and how many more they need to make to get a reward. There is some variation in how we present progress on the app’s discover page as compared to the more detailed pages. The discover page may be all visual while the detailed page may also include numerical information but in a smaller and fainter font.”	More Visual: “Our app users tend to be low involvement consumers, so I imagine that visual displays might be more motivating for them.”
Senior Loyalty Executive	Travel, Retail	Moderate Variation “Seen both sides. Large legacy airlines move toward graphical, especially with gamification.”	It Depends: “It depends on the program. Give customers more info but present it graphically in nature. Take forefront with graphical but also provide numerical information.”
Director of Alliances, Major Latin American Airline	Travel	High Variation: There is significant variation and it will partially depend on the product category. For a low stake decision, visual may be relatively common, but for higher stakes decisions such as airlines or hotels redemptions, numeric may be more prevalent as people need that certainty.	It Depends: I think visual can be more stimulating, personally, I am a visual person. However, this may depend on the person and the stakes. If it’s an important decision people will need to see the numbers.

information in these apps to depict their customers’ progress towards a goal. Participants were successively shown images taken from 20 different loyalty apps, one per screen (presentation order randomized), and asked to evaluate whether the firm primarily emphasizes numerical or visual goal progress information. The loyalty apps selected for inclusion in this pilot study were on Newsweek’s (2024) list of “America’s Best Loyalty Programs” and spanned a broad range of categories, including clothing, groceries, health/beauty, and restaurants.

Participants viewed each loyalty app image for at least five seconds and were asked: “Focusing only on loyalty progress information, what kind of information does the app primarily emphasize?” They reported their answer on a sliding scale (0=visual, 100=numerical).

We also included an attention check at the end of the survey, along with questions about participants’ actual use of LPs and their current mood. However, these variables in our analysis did not meaningfully affect our results and are therefore not discussed further.²

Table 2 shows the mean ratings for each of the 20 loyalty apps, with lower numbers indicating that the app emphasizes visual information and higher numbers indicating that the app emphasizes numerical information. For the 20 apps, mean ratings were below the midpoint of 50 for eleven of

the apps, whereas mean ratings were above the midpoint of 50 for nine of the apps.

We conducted 20 separate one-sample t-tests to compare the mean rating for each app to the scale midpoint of 50.

Table 2 Relative emphasis on visual versus numerical information for 20 popular loyalty apps (Pilot study A)

Brand loyalty app	Mean rating	SD	One sample t-value (vs. scale midpoint)	p-value
Jimmy John’s	15.63	21.61	−31.92	<0.001
Wawa	25.42	21.67	−22.77	<0.001
DSW	34.62	23.54	−13.11	<0.001
Hardees	35.31	25.40	−11.61	<0.001
Dunkin	38.33	25.03	−9.36	<0.001
Cumberland Farms	38.97	25.15	−8.80	<0.001
Lowes	39.03	26.70	−8.25	<0.001
Home Depot	41.79	26.71	−6.17	<0.001
Subway	43.73	25.99	−4.84	<0.001
Macy’s	44.24	25.02	−4.63	<0.001
Chick-fil-a	45.60	25.46	−3.47	<0.001
Potbellys	50.08	24.31	0.06	0.949
Freddy’s	53.05	23.22	2.64	0.009
Kohl’s	63.05	23.56	11.12	<0.001
Marriott	65.88	23.23	13.73	<0.001
Nordstrom	67.16	21.82	15.79	<0.001
Hyatt	69.88	24.40	16.36	<0.001
TJX	69.92	20.26	19.74	<0.001
Belk’s	71.42	22.53	19.09	<0.001
Tillys	83.22	18.46	36.12	<0.001

Note: Lower mean ratings indicate that visual information is emphasized; higher mean ratings indicate that numerical information is emphasized. Mean ratings for Potbellys and Freddy’s do not differ from the scale midpoint, after Bonferroni correction

² 90 of the 403 participants failed the attention check; excluding these participants resulted in the mean rating of Chick-fil-A no longer being significantly lower than the midpoint, but none of the other apps were affected.

Significance was tested using Bonferroni-adjusted alpha levels of 0.0025 per test. (0.05/20). As shown in Table 2, mean ratings for 11 of the apps were significantly below the midpoint, indicating that they were perceived as emphasizing visual information. Mean ratings for 7 of the apps were significantly above the midpoint, indicating that they were perceived as emphasizing numerical information. Mean ratings for two of the apps (i.e., Potbellys and Freddys) did not differ significantly from 50 (after the Bonferroni correction), suggesting no significant emphasis on either visual or numerical information.

Figure 2 presents an alternative representation of the ratings for the visual and numerical variation in LP reward progress displays for these 20 apps. Collectively, the results of this consumer survey suggest that there is considerable variation in the extent to which loyalty apps emphasize visual versus numerical information.

Theoretical background

According to the “information format” hypothesis (Bettman & Kakkar, 1977; Bettman, 1979), changes in information presentation have a direct effect on information acquisition strategies and ease of mental processing (Kleinmuntz & Schkade, 1993; Schkade & Kleinmuntz, 1994). Presentation format can influence consumer judgments across numerous contexts, including risk assessment (e.g., Raghubir & Das, 2010) and financial decision-making (e.g., Duclos, 2015). Different presentations of identical quantitative information can produce disparate consumer perceptions. The same data presented visually as stocks vs. flows can yield oppositely-valenced assessments and differentially optimistic forecasts (Spiller et al., 2020). Similarly, the same numerical information (e.g., prices) in visual, verbal, or analog formats can

produce disparate consumer judgments (Bagchi & Davis, 2016; Romero et al., 2025).

Presenting quantitative information more visually versus more numerically

Prior research has not systematically examined the role of more numerical versus more visual display formats on LP progress perceptions. However, research on visual and numerical display formats in non-LP contexts suggests that they often produce different consumer responses. Visual (vs. numerical) information diminishes risk-taking behaviors (Stone et al., 1997) but also narrows consumers’ attention to a reduced number of choice alternatives (Lurie & Mason, 2007). These display format differences may occur because visual information processing is relatively automatic, requiring fewer cognitive resources (McGloin et al., 2009).

How might LP customers respond to and act upon more visual versus more numerical displays of equivalent loyalty reward progress? One possibility, consistent with the premonition of many industry experts (as shown in Table 1), is that visual displays will be more motivating. Such a prediction, which is consistent with the adage that a picture is worth a thousand words, has received empirical support in domains ranging from social media engagement (Stekalova & Krieger, 2017) to exercise motivation (Johnston & Davis, 2019).

Another more nuanced prediction is that more visual (vs. more numerical) displays will lead to greater motivation and higher progress estimates, but only under specific circumstances. Such a prediction aligns with prior research, which shows that when consumers are objectively closer to their goal, ease of goal visualization enhances perceptions of proximity to the goal and intensifies goal pursuit (Cheema & Bagchi, 2011). Based on this work, one might



Fig. 2 Visual/numerical variation in LP reward progress displays (Pilot Study)

expect no effect of display format when LP customers are objectively further from their reward; however, more visual (vs. more numerical) displays are expected to lead to greater motivation and higher progress estimates when customers are objectively closer to their reward.

We offer an alternative proposition, one that stems from a bias in visual attention. Specifically, we propose a *visual moderation effect* in which LP customers who encounter a more visual display of progress will overestimate their reward progress when objective progress is low but underestimate their progress when objective progress is high. We further propose that this effect is unique to more visual indicators of loyalty reward progress. Therefore, the effect will be attenuated for LP customers who encounter a more numerical display of reward progress.

Propositions underlying the visual moderation effect

The visual moderation effect is based on four key propositions. First, LP customers who encounter a more visual display of their reward progress will disproportionately attend to the visual representation of progress (e.g., block bar chart, circular ring) compared to less prominent (or missing) numerical information. This claim aligns with research showing that consumers rely on more salient information despite the presence of other, less salient information that, if considered, could lead to more informed judgments (Liu et al., 2023; Whitley et al., 2025).

The second proposition is that when consumers rely on more visual stimuli, they will feel less confident about the progress they have made toward their reward. More visual displays of LP progress are typically perceived as ambiguous and imprecise—at least in comparison to more numerical displays (Lurie & Mason, 2007). If LP customers attend to more numerical information (e.g., “you have 30 points out of 100” to redeem a reward), they will possess exact and complete information about their actual reward progress. However, if they attend to more visual information (e.g., a progress bar that is 30% shaded to redeem a reward), they may not be entirely sure how this visual representation translates into objective progress. As initial evidence for this proposition, we conducted a pre-registered Pilot Study B (<https://aspredicted.org/5xwz-txcf.pdf>), in which 201 students at a large public university in the U.S. (40.8% female; $M_{age} = 20.46$, $SD = 2.36$) sequentially rated whether 16 different LP displays were more visual or more numeric (0=visual, 100=numerical) and how confident they were about the amount of progress they had made toward the loyalty reward (0=not very confident, 100=very confident). We counterbalanced the order in which participants provided these two ratings. As expected, we observed a significant

positive correlation between these ratings ($r = .40$, $p < .001$), such that more numerical displays were associated with greater confidence.

The third proposition is that LP customers’ lower confidence about their progress when encountering a more visual display will lead them to assume that their objective progress is closer to the middle of their visual range. This proposition is derived from the human tendency to focus on the center of a scene—a response known as the centrality bias or central fixation bias (Atalay et al., 2012). This attentional bias can systematically influence subsequent judgments and choices. For instance, research has shown that when individuals are choosing from an array of options that they believe are equally probable, they rely on the heuristic of choosing options toward the middle (e.g., Christenfeld, 1995; Popovich & Hamilton, 2025; Shaw et al., 2000). This heuristic allows individuals “to minimize [the] mental effort” (Shaw et al., 2000, p. 158) that would otherwise be required to distinguish among undifferentiated options. Hence, LP customers who encounter a more visual display may be influenced by the centrality bias when estimating their reward progress. Thus, we anticipate that they will provide values closer to the middle of the possible range (i.e., halfway to the reward) when progress information is presented more visually.

The fourth and final proposition is that when LP customers perceive their progress toward a reward to be further advanced, they will feel greater motivation to secure the reward. This proposition aligns with the literature on goal pursuit (Huang & Zhang, 2011; Wang et al., 2016) and specifically with the classic goal-gradient hypothesis (Hull, 1932), which posits that the motivation to reach a goal increases as one moves closer to the goal. Evidence for the goal-gradient hypothesis has been demonstrated in the context of LPs (Kivetz et al., 2006; Nunes & Drèze, 2006). Our contention that different display formats (i.e., more visual vs. more numerical) may differentially affect LP customers’ motivation aligns with past work showing that subtle changes in the way goal progress is communicated can influence consumption behavior (Wiebenga & Fennis, 2014) in the context of LPs (Bagchi & Li, 2011; Koo & Fishbach, 2008, 2012). We expect that when actual LP progress is low, a more visual display of LP progress will lead consumers to overestimate their progress and undertake behaviors that further accelerate their progress toward a reward (e.g., patronizing the firm again soon to advance their progress). The opposite is expected when actual LP progress is high—a more visual display of LP progress should lead customers to underestimate their progress and forego behaviors that further accelerate reward progress. Based on these propositions, we created a conceptual framework, which is illustrated in Fig. 3.

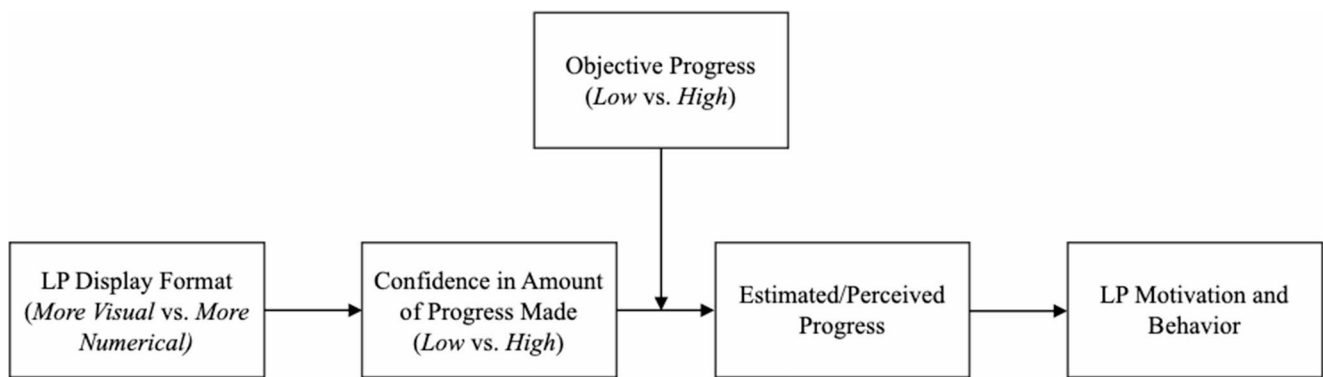


Fig. 3 Conceptual framework

The following hypotheses underlie our conceptual framework:

- H1** (The Visual Moderation Effect): LP customers who encounter a more visual display of progress will overestimate their reward progress when objective progress is low but underestimate their progress when objective progress is high.
- H2A** (Behavioral Outcomes when Objective Progress is Low): When objective progress is low, LP customers who encounter a more visual display of progress will express behavioral intentions and undertake consequential behaviors reflective of greater motivation and higher reward progress estimates.
- H2B** (Behavioral Outcomes when Objective Progress is High): When objective progress is high, LP customers who encounter a more numerical display of progress will express behavioral intentions and undertake consequential behaviors reflective of greater motivation and higher reward progress estimates.
- H3** (Explanatory Role of Confidence): LP customers' lower confidence when encountering a more visual display will differentially affect their perceived progress and associated consequential behaviors depending on whether their objective progress level is high versus low.

Overview of our main studies

We test these hypotheses in nine studies in which participants estimated their progress toward a loyalty program reward soon after encountering a LP display. Importantly, we also examine the downstream consequences of the visual moderation effect on managerially relevant and

consequential consumer intentions and behaviors (e.g., the decision to patronize a retailer). In Study 1, we leverage a within-subjects approach to directly test the impact of a visual loyalty program display on estimated progress (as compared to objective progress). Studies 2 (field experiment) and 3a (lab experiment) are between-participant experiments showing that when objective progress toward a reward is low, consumers who encounter a more visual (vs. a more numerical) LP display undertake consequential behaviors reflective of greater motivation and higher reward progress estimates. Study 3b finds that when objective progress toward a reward is high, consumers who encounter a more numerical (vs. a more visual) LP display undertake consequential behaviors reflective of greater motivation and higher reward progress estimates. Studies 4a and 4b provide more direct evidence that a more visual (vs. a more numerical) LP display leads to more moderate reward progress estimates. Study 5 replicates this effect and provides evidence that it is driven by the lower confidence of consumers who encounter a more visual LP display. Studies 6a and 6b examine display formats that are situated relatively closer to one another, on the display format continuum, and find that the visual moderation effect largely persists. The exact wording of the stimuli and measures used in all studies appears in Web Appendix C.

Study 1: Initial demonstration of the visual moderation effect

Study 1 uses a within-subjects approach to directly examine the impact of a visual loyalty program display on estimated progress (as compared to objective progress). We test whether participants who encounter visual displays of loyalty reward progress overestimate progress when objective progress is low and underestimate progress when objective progress is high, in accordance with our proposed visual moderation effect.

Table 3 Proportion of estimates at each numerical value (Study 1)

Estimate	Low Progress (2)	Medium Progress (5)	High Progress (8)
0	0	0	0
1	0.5	0	0
2	83.4	0	0
3	14.0	0.5	0
4	0.5	10.9	0
5	0.5	85.5	1.6
6	0	1.0	0
7	0	0	13.5
8	0	0	82.4
9	0	0	1.6
10	1.0	2.1	1.0
Total	100%	100%	100%

Note: Light gray=underestimate; Black=accurate; Dark gray=overestimate

Method

Sample and procedure The study was conducted online with 193 students at a large public university in the U.S. (57.0% female; $M_{\text{age}} = 20.37$, $SD = 1.68$) who participated in exchange for course credit. The study involved a single factor, 3-cell (objective progress: low, medium, high) within-participant design. Study participants learned about a local coffee shop near their home, Mountain Coffee and Tea. The coffee shop offered an LP where patrons could download the Mountain Coffee app and scan it after every purchase. Once they had made ten qualified purchases, LP members would be eligible for a free food or drink item.

After learning about Mountain Coffee's LP, participants were told that they would observe three screenshots from the apps of different LP members, one at a time. Their task was to estimate each customer's progress toward the loyalty program goal.

Next, participants successively encountered three visual progress displays—low, medium, and high progress. The visual progress displays were represented by a horizontal progress bar, with a fraction of the bar—either 2/10 (low objective progress), 5/10 (medium objective progress), or 8/10 (high objective progress)—shaded yellow (order randomized). After encountering each progress display, participants estimated the number of purchases the customer had made (single-response multiple-choice question: 0–10).³

³ As an exploratory measure, participants also indicated how confident they felt in their estimate of the number of purchases on a sliding scale anchored at "Not very confident" (0) and "Very confident" (100). Unlike our subsequent studies, Study 1 did not include numerical displays. Since we did not have an a priori prediction about how confidence ratings would differ for different visual displays, this analysis is reported in Web Appendix D.

Results and discussion

Table 3 shows the proportion of numerical estimates - at each numerical value (0–10) - for the low, medium, and high progress displays. Over 80% of participants provided accurate estimates, a percentage that was consistent across the three displays (low progress: 83.4% accurate, medium progress: 85.5% accurate, high progress: 82.4% accurate). We calculated a deviation score by subtracting the objective progress level from the participants' estimated progress level. Negative deviation scores correspond to underestimates, whereas positive deviations correspond to overestimates. Next, we conducted a 3 (objective progress: low, medium, high) x 6 (presentation order) mixed ANOVA on this deviation score, with objective progress as a within-participant factor. We observed a significant main effect of objective progress ($F(2, 374) = 19.47$, $p < .001$, $\eta_p^2 = 0.094$), but no effect of presentation order ($F(5, 187) = 0.47$, $p = .80$, $\eta_p^2 = 0.012$) nor a significant interaction ($F(10, 374) = 0.75$, $p = .68$, $\eta_p^2 = 0.020$). The mean deviation of estimates for the low progress display ($M = +0.244$, $SD = 0.91$) was greater than the mean deviation of estimates for the medium progress display ($M = -0.005$, $SD = 0.81$; $F(1, 374) = 16.13$, $p < .001$) or for the high progress display ($M = -0.145$, $SD = 0.56$; $F(1, 374) = 32.33$, $p < .001$). The mean deviation of estimates for the medium progress display was greater than that for the high progress display ($F(1, 374) = 5.86$, $p = .016$).

Notably, the mean deviation of estimates for the low progress display was positive and significantly different from zero ($t(192) = 3.74$, $p < .001$, $d = 0.27$), implying overestimation. The mean deviation of estimates for the high progress display was negative and significantly different from zero ($t(192) = -3.61$, $p < .001$, $d = -0.26$), implying underestimation. The mean deviation of estimates for the medium progress display was not significantly different from zero ($t(192) = -0.09$, $p = .93$, $d = -0.01$). Taken together, this

pattern of results is consistent with our hypothesized visual moderation effect (H1), in which the estimates of participants who encounter a visual display of progress toward a reward are skewed more moderate (i.e., less extreme).

As a separate analysis, instead of focusing on the magnitude by which participants' estimates deviated from the objective level of progress, we simply coded each response as an underestimate (−1), an accurate estimate (0), or an overestimate (+1). For the low progress display, overestimates were significantly more common than underestimates: after excluding accurate estimates, 96.9% of estimation errors were overestimates, a proportion greater than chance ($\chi^2(1)=28.13, p<.001$). For the high progress display, underestimates were much more common than overestimates: 85.2% of estimation errors were underestimates, which is a proportion greater than chance ($\chi^2(1)=16.94, p<.001$). Although not predicted a priori, the results of this additional analysis indicate that underestimates were also more common for the medium progress display: 78.6% of estimation errors were underestimated, also a proportion greater than chance ($\chi^2(1)=9.14, p=.003$).

One potential concern is that these results may be an artifact of the choice architecture used. Specifically, there were only two underestimation response options (i.e., 0, 1) for the low progress display, compared to eight overestimation response options (i.e., 3, 4, 5, 6, 7, 8, 9, 10). The opposite is true for the high progress display (i.e., eight underestimation options vs. two overestimation options). Therefore, as a conservative test, we compared choice shares only for the response option just below versus just above participants' objective progress. For the low progress display, 96.4% of participants made an overestimate (i.e., by selecting 3 rather than 1), which is a proportion greater than chance ($\chi^2(1)=24.14, p<.001$). For the high progress display, 89.7% of participants made an underestimate (i.e., by selecting 7 rather than 9), which is a proportion greater than chance ($\chi^2(1)=18.24, p<.001$). Similarly, for the medium progress display, 91.3% of participants made an underestimate (i.e., by selecting 4 instead of 6), which is a proportion greater than chance ($\chi^2(1)=15.70, p<.001$). The results of Study 1 are consistent with our proposal of a visual moderation effect in more visual loyalty program progress displays.

Study 2: The visual moderation effect manifests in a field experiment with physical loyalty cards

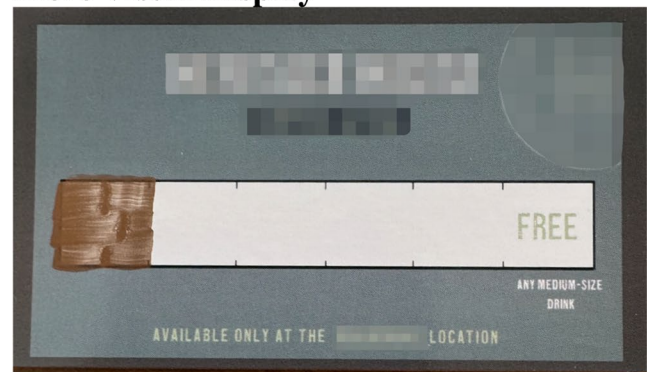
We anticipate that when consumers' objective progress toward a reward is low, encountering a more visual (vs. a more numerical) display of loyalty progress will lead them to overestimate their progress and to feel greater

motivation to secure the reward. Thus, these customers should undertake consequential behaviors that reflect their greater motivation and higher reward progress perceptions, as was proposed in H2A. We test this prediction in Studies 2 and 3 A, in which we move beyond estimated progress perceptions to examine consequential behavior (Hulland & Houston, 2021) when objective progress is low. Study 2 is a field experiment conducted in partnership with a coffee shop to investigate whether displaying loyalty progress in more visual versus numerical formats affects repeated patronage.

Method

Sample and procedure For this experiment, we collaborated with the owner of a coffee shop in the southern United States to create a pair of physical loyalty cards, one that was more visual and one that was more numerical. See Fig. 4. Coffee shop employees distributed a total of 200 loyalty cards (100 visual, 100 numerical) to customers over a single-day period in an alternating sequence (numerical, visual, numerical, visual, etc.). The cards differed only in terms of how progress towards a loyalty reward (i.e., a free

More Visual Display



More Numerical Display



Fig. 4 More visual versus more numerical displays (Study 2)

medium-sized drink after five purchases) was depicted and recorded.

The visual loyalty card contained a horizontal bar with faint hash marks representing each purchase before the LP customer earned a free drink. Each time a customer with a visual loyalty card made a purchase, coffee shop employees were instructed to use a special marker to shade the progress bar up to the next hash mark. The numerical loyalty card displayed the numbers 1 to 5, each enclosed in a circle. Each time a customer with a numerical loyalty card made a purchase, coffee shop employees were instructed to use a marker to fill in the corresponding circle for each purchase. All customers were credited with an initial purchase when they received their loyalty card after their first visit.

Each of the 200 loyalty cards was assigned a unique (randomly generated) customer.

Number printed on the back of the card. These numbers allowed us to (1) keep track of the loyalty card's experimental condition (i.e., more visual vs. more numeric), and (2) connect each card to a unique customer's subsequent purchases without recording identifiable information. Employees were given a log to track purchases during the experiment. Whenever an LP customer made a purchase, coffee shop employees matched the unique customer number, recorded the purchasing date, and the customer's progress (i.e., 1–5) toward the reward. Prior to conducting the study, we agreed to analyze two weeks of data for the field experiment. During that time, the coffee shop owner agreed to pause all other promotional efforts as they might create confounds.

Results and discussion

Of the 200 loyalty cards distributed, coffee shop employees logged LP progress information for 142 customers (i.e., 73 more visual, 69 more numerical), meaning that 71% of LP customers who received a card re-patronized the coffee shop at least once more during the 2-week period.

We propose that when objective progress toward a reward is low, a more visual (vs. more numerical) representation of loyalty progress will be particularly motivating and therefore accelerate repeated patronage (allowing customers to earn their reward more quickly). To test this proposition, we compared the mean interval (in days) between customers' first purchase (i.e., the date they received the loyalty card) and their first return visit to the coffee shop. Consistent with our theorizing, the number of days between visits was (marginally) lower among customers in the more visual condition ($M_{\text{visual}} = 3.88$, $SD = 3.13$) as compared to participants in the more numerical condition ($M_{\text{numerical}} = 4.80$, $SD = 3.22$; $F(1,141) = 2.99$, $p = .086$, $\eta^2 = 0.02$). This indicates that the more visual loyalty card prompted faster repeated

patronage when objective progress to the reward was low (i.e., below the midpoint of 3 visits).

A total of 133 customers (i.e., 68 more visual, 65 more numerical) visited the coffee shop at least three times during the 2-week period (i.e., they made at least two return visits after receiving the loyalty card). Among these customers, the number of days required to reach the half-way point toward their reward (i.e., 3 out of 5 visits) was (marginally) lower among customers in the more visual condition ($M_{\text{visual}} = 7.96$, $SD = 3.23$) as compared to participants in the more numerical condition ($M_{\text{numerical}} = 9.03$, $SD = 3.26$; $F(1,132) = 3.65$, $p = .058$, $\eta^2 = 0.03$). It is worth noting that when comparing the mean interval between participants' second and third visits, the effect of loyalty card type becomes non-significant ($M_{\text{visual}} = 4.28$, $SD = 2.26$ vs. $M_{\text{numerical}} = 4.60$, $SD = 2.73$; $F(1,132) = 0.54$, $p = .46$, $\eta^2 = 0.004$). This result suggests that the motivational advantage of the more visual (vs. more numerical) loyalty card is reduced as objective progress approaches the midpoint (i.e., three out of five visits).

Based on our theorizing, we expect the more numerical (vs. more visual) loyalty card to be optimal beyond the midpoint, when customers' objective progress toward a reward is high. However, as only a relatively small subset of customers who received loyalty cards made four or five coffee shop visits during the 2-week period, we have insufficient data to formally test this hypothesis (Note, however, that we test our full model in the last five studies of this paper).

Study 2 allowed us to examine whether more visual (vs. more numerical) displays of loyalty progress affect repeated patronage in a field setting. Consistent with H2A, we find that in the early stages of the loyalty reward journey, a more visual (vs. more numerical) LP display results in faster repeat visits, presumably because LP customers feel they have made greater progress and are therefore more motivated to continue making progress toward their loyalty reward.

Study 3a: The visual moderation effect affects customer word-of-mouth for a digital loyalty app under low objective progress

Study 3a aims to further demonstrate the external validity of our findings in the context of a digital loyalty app, using a real company (i.e., Starbucks) and stimuli that resemble the company's mobile app. We again examine real LP customers whose objective loyalty progress is low, and we predict that a more visual (vs. more numerical) LP display will increase the likelihood that LP customers will provide positive WOM about the company on their social media feed.

Method

Sample and procedure This pre-registered study (<https://aspredicted.org/wkms-9vrn.pdf>) was conducted online with 482 Starbucks loyalty app users who were also students at a large public university in the U.S. (57.7% female; $M_{age} = 20.20$, $SD = 1.86$ participating for course credit. The study format followed a 2-cell (display: more visual vs. more numerical) between-subjects design. Students were instructed to reflect on the fact that as they left home, they drove directly to their local Starbucks to get some coffee. After placing their order, scanning their loyalty app, and paying for the drink, they checked their loyalty reward progress towards a free drink. At random, we varied progress information such that participants in the visual display condition viewed a screenshot of the Starbucks loyalty app displaying a horizontal visual progress bar indicating a progress of about 16% (which equates to 8 out of 50 stars) highlighted in yellow, and the number of already progressed stars (i.e., “8”) faded. Participants in the numerical display condition viewed the same screenshot of the Starbucks loyalty app, but in this case, the yellow-colored visual progress bar was faded, while the numerical progress was emphasized in bold. Objective progress towards the free drink was identical and low (i.e., 16%) in both conditions.

To directly test our prediction that those in more visual (vs. more numerical) displays would overestimate their progress when objective progress was low, we administered three items. Participants reported on sliding scales how much overall progress they thought had been made towards their goal of reaching the next reward (0 = very little, 100 = a lot), 2), how pessimistic/optimistic they felt about reaching their next reward (0 = very pessimistic, 100 = very optimistic), and how far/close they were from their goal of reaching the next reward (0 = very far, 100 = very close). We averaged these three items to create a composite measure of perceived progress ($\alpha = 0.88$).

As a behavioral outcome, participants were told that Starbucks was offering 50 loyalty stars to LP customers who agreed to post on social media about their enthusiasm for the prospect of receiving a Starbucks reward. Participants indicated if they would post by answering either “yes” or “no.” This is a consequential word-of-mouth measure, as participants, at the time of answering, expected to write a post later in the study. Lastly, we asked participants how often they purchase from Starbucks, how frequently they purchase coffee or similar drinks (1 = not at all, 7 = very often), whether they participate in any loyalty rewards programs from restaurants and other businesses (yes-no), and about their mood (1 = extremely unhappy; 7 = extremely happy; 1 = extremely bad; extremely good) as well as demographics (accounting for these control did not change the study’s results). At the

end of the study, we included a disclaimer revealing that Starbucks was not actually offering those free loyalty stars. Instead, participants were entered into a raffle for actual gift cards (worth more than 50 loyalty stars).

Results and discussion

We first conducted an ANCOVA on our composite measure of perceived progress, including all potential covariates in our analysis. Except for the frequency that participants purchased Starbucks products ($p < .001$), and participation in loyalty rewards programs from restaurants and other business ($p < .05$), the other covariates were non-significant ($p > .05$). Importantly, there was a marginally significant difference between the more visual ($M_{\text{more visual}} = 45.32$, $SD = 24.53$) and the more numerical ($M_{\text{more numerical}} = 42.14$, $SD = 24.59$) display conditions on our composite attitudinal measure ($F(1, 472) = 2.86$, $p = .091$, $d = 0.13$). When objective progress was low, LP customers who viewed a more visual display perceived their progress toward the loyalty reward to be closer to the reward than those who encountered a more numerical display, in line with our theorizing.⁴

A total of 225 participants agreed to post about receiving the loyalty stars Starbucks was offering. In support of our theorizing, whereas 56.4% of participants in the more visual condition opted to post on social media, only 43.6% did so in the more numerical condition ($\chi^2(1) = 3.74$, $p = .053$, $\phi = 0.13$). This outcome indicates that when objective progress was lower, those in the more visual condition were marginally more willing to generate positive word-of-mouth towards Starbucks compared to participants in the more numerical condition.

Collectively, the results of Studies 2 and 3a support H2A and show that when objective progress toward a reward is low, more visual progress displays outperform more numerical LP progress displays when considering different consequential behaviors, both for digital and physical loyalty cards.

Study 3b: The visual moderation effect affects customer word-of-mouth for a digital loyalty app under high objective progress

Study 3b attempts to further illustrate the external validity of our findings in the context of a digital loyalty app, using the same real company (i.e., Starbucks) as in Study 3a and stimuli that resemble the company’s mobile app. We turn to examining real LP customers whose objective loyalty progress is high, and we predict – in accordance with H2B

⁴ The results of an ANOVA that does not account for any covariates are: $F(1, 480) = 2.01$, $p = .157$, $d = 0.13$.

– that a more numerical (vs. more visual) LP display will increase the likelihood that LP customers will provide positive WOM about the company on their social media feed.

Method

Sample and procedure This pre-registered study (<https://aspredicted.org/bp85-jp39.pdf>) was conducted online with 320 Starbucks loyalty app users who were also students at a large public university in the U.S. (57.2% female; $M_{age} = 20.32$, $SD = 1.32$) participating for course credit. The study format followed a 2-cell (display: more visual vs. more numerical) between-subjects design. Students were instructed to reflect on the fact that as they left home, they drove directly to their local Starbucks to get some coffee. After placing their order, scanning their loyalty app, and paying for the drink, they checked their loyalty reward progress towards a free drink. At random, we varied progress information such that participants in the visual display condition viewed a screenshot of the Starbucks loyalty app displaying a horizontal visual progress bar indicating a progress of about 84% (which equates to 42 out of 50 stars) highlighted in yellow, and the number of already progressed stars (i.e., “42”) faded. Participants in the numerical display condition viewed the same screenshot of the Starbucks loyalty app, but in this case, the yellow-colored visual progress bar was faded, while the numerical progress was emphasized in bold. Objective progress towards the free drink was identical and high (i.e., 84%) in both conditions. To directly test our prediction that those in more numerical (vs. more visual) displays would overestimate their progress when objective progress was high, we administered three items. Participants reported on sliding scales how much overall progress they thought had been made towards their goal of reaching the next reward (0=very little, 100=a lot), 2), how pessimistic/optimistic they felt about reaching their next reward (0=very pessimistic, 100=very optimistic), and how far/close they were from their goal of reaching the next reward (0=very far, 100=very close). We averaged these three items to create a composite measure of perceived progress ($\alpha = 0.89$).

As a behavioral outcome, we again told participants similar to study 3a that Starbucks was offering 50 loyalty stars to LP customers who agreed to post on social media about their enthusiasm for the prospect of receiving a Starbucks reward. Participants indicated if they would post by answering either “yes” or “no.” This is a consequential word-of-mouth measure, as participants, at the time of answering, expected to write a post later in the study. Lastly, we asked participants how often they purchase from Starbucks, how frequently they purchase coffee or similar drinks (1=not at all, 7=very often), whether they participate in any loyalty rewards programs

from restaurants and other businesses (yes-no), and about their mood (1=extremely unhappy; 7=extremely happy; 1=extremely bad; extremely good) as well as demographics (accounting for these control did not change the study’s results). At the end of the study, we included a disclaimer revealing that Starbucks was not actually offering those free loyalty stars. Instead, participants were entered into a raffle for actual gift cards (worth more than 50 loyalty stars).

Results and discussion

We first conducted an ANCOVA on our composite measure of perceived progress, including all potential covariates in our analysis. Except for the frequency that participants purchased Starbucks products ($p = .036$) and bought coffee or similar drinks ($p = .039$), the other covariates were non-significant ($p > .05$). Importantly, there was a significant difference between the more numerical ($M_{\text{more numerical}} = 77.05$, $SD = 19.98$) and the more visual ($M_{\text{more visual}} = 69.01$, $SD = 27.59$) display conditions on our composite attitudinal measure ($F(1, 313) = 9.90$, $p = .002$, $d = 0.35$). When objective progress was high, LP customers who viewed a more numerical display perceived their progress toward the loyalty reward to be closer to the reward than those who encountered a more visual display, in line with our theorizing.⁵

A total of 165 participants agreed to post about receiving the loyalty stars Starbucks was offering. In support of our theorizing, whereas 57.2% of participants in the more numerical condition opted to post on social media, only 46% did so in the more visual condition ($\chi^2(1) = 4.07$, $p = .044$, $\phi = 0.11$). This outcome indicates that when objective progress was higher, those in the more numerical condition were more willing to generate positive word-of-mouth towards Starbucks compared to participants in the more visual condition.

Collectively, the results of Studies 2, 3a, and 3b examine consequential behaviors to show that (1) when objective progress toward a reward is low, more visual progress displays outperform more numerical LP progress displays (H2A), whereas (2) when objective progress toward a reward is high, more numerical progress displays outperform more visual ones (H2B).

Study 4a: Visual moderation effect attenuation for more numerical displays

Building on Studies 2 and 3 which provide external validity for our theorizing, studies 4a and 4b comprehensively test how LP customers respond to more visual versus more

⁵ The results of an ANOVA that does not account for any covariates are: $F(1, 318) = 8.89$, $p = .003$, $d = 0.33$.

numerical displays, both when objective progress is low *and* high. Our prediction is that a more visual (vs. a more numerical) LP display will lead to more moderate (i.e., less extreme) reward progress perceptions. Study 4a uses a within-participant design in which each participant in this study makes 30 different judgments of perceived progress, thereby allowing for a rich test of the robustness of the visual moderation effect.

Method

Sample and procedure Study 4a was conducted online with 588 students at a large public university in the U.S. (45.3% female, average age=20.54, $SD=0.90$) for course credit. These participants received information about a local frozen yogurt shop called “The Yogurt Shop.” They learned that The Yogurt Shop had an LP in which customers would accumulate “points” after every yogurt purchase and earn a free yogurt after accumulating enough points. LP customers could track their progress towards this reward on a mobile app.

Next, participants learned that they would be shown 30 different progress indicators from this app, each conveying the progress a customer had made toward earning a free yogurt. Participants were asked to imagine that they were viewing each progress indicator on their own app and would be estimating how much progress they had made toward the reward. Importantly, participants were advised to treat each of the 30 progress indicators separately and independently.

All participants then encountered 30 progress indicators, either 15 more visual displays followed by 15 more numerical displays or vice versa (LP display presentation order was a manipulated factor in this experiment). The more visual displays were represented by a horizontal progress bar, with a fraction of the bar ranging from 1/15th to 15/15th shaded green (order randomized). Instead of a progress bar, the more numerical displays contained the sentence “YOU HAVE: [FRACTION] paid purchases,” with the fraction ranging from 1/15 to 15/15 (order randomized). After encountering each progress indicator, participants were asked the identical question, “Think about the progress you made and the progress you have remaining. At this point, how much progress overall do you feel you have made towards getting a free yogurt?” On each occasion, they selected an option from a seven-point scale, which was anchored at “A little progress, just starting out” (1) and “A lot of progress, almost done” (7). Thus, this study involved a 2 (display: more visual, more numerical) \times 2 (display presentation order: more visual first, more numerical first) \times 15 (objective progress: 1/15, 2/15, 3/15, 4/15, 5/15, 6/15, 7/15, 8/15, 9/15, 10/15, 11/15, 12/15, 13/15, 14/15, 15/15) mixed

design, with display presentation order as the only between-participant factor.

Results and discussion

We conducted a 2 (display) \times 2 (display presentation order) \times 15 (objective progress) mixed ANOVA on perceived progress, in which display presentation order was the only between-participant factor. We obtained a significant three-way interaction ($F(14, 568)=2.57, p=.001, \eta_p^2=0.06$). To decompose this interaction, we examined the interaction between display and objective progress separately for each display presentation order. When more numerical displays were presented first, we observed a significant main effect of objective progress ($F(14, 266)=606.48, p<.001, \eta_p^2=0.97$), a significant main effect of display ($F(1, 279)=13.52, p<.001, \eta_p^2=0.05$), and a significant interaction between display and objective progress ($F(14, 266)=8.97, p<.001, \eta_p^2=0.32$). When more visual displays were presented first, we observed a significant main effect of objective progress ($F(14, 289)=1113.67, p<.001, \eta_p^2=0.98$), no main effect of display ($F(1, 302)=0.60, p=.44, \eta_p^2=0.002$), and a significant interaction between display and objective progress ($F(14, 289)=11.87, p<.001, \eta_p^2=0.37$). Importantly, the same interaction effect—consistent with our proposed visual moderation effect—was observed irrespective of display presentation order. Therefore, for ease of exposition, our subsequent analyses focus exclusively on the display and objective progress variables only (collapsing across display presentation order).

Table 4 compares perceived progress for more visual and more numerical displays at each level of objective progress and includes statistical tests (i.e., contrast analyses from the mixed ANOVA described above). This same information is depicted visually in Fig. 5 as perceived progress difference (more visual less more numerical) at each level of objective progress. Both Table 4; Fig. 5 indicate that consumers perceive their progress as less extreme (i.e., more moderate) when the same objective progress is displayed more visually (vs. more numerically). At low levels of objective progress (i.e., 1/15, 2/15, 3/15, 4/15, and 5/15), perceived progress is higher when objective progress is displayed more visually (vs. more numerically). The pattern reverses at higher levels of objective progress, and perceived progress is lower when objective progress is presented more visually (vs. more numerically). This perception shift is consistent with our proposed visual moderation effect.

The results of Study 4a are consistent with our proposed visual moderation effect on progress perceptions. That is, a more visual (vs. a more numerical) LP display leads to more moderate reward progress perceptions using a within-participant design.

Table 4 Perceived progress at each level of objective progress (Study 4a)

Objective progress (out of 15)	More visual display mean (SD)	More numerical display mean (SD)	Difference (More Visual Less More Numerical)	F-statistic	<i>p</i> -value	η_p^2
1	1.20 (0.83)	1.16 (0.80)	+0.04	1.38	0.24	0.002
2	1.49 (0.83)	1.27 (0.87)	+0.22	28.09	<0.001	0.046
3	1.98 (0.69)	1.72 (0.94)	+0.27	44.81	<0.001	0.072
4	2.39 (0.86)	2.12 (0.77)	+0.27	46.31	<0.001	0.074
5	2.80 (0.74)	2.57 (0.82)	+0.23	33.72	<0.001	0.055
6	3.02 (0.69)	3.12 (0.91)	-0.10	6.89	0.01	0.012
7	3.60 (0.79)	3.87 (0.86)	-0.27	40.88	<0.001	0.066
8	4.07 (0.70)	4.15 (0.86)	-0.08	3.30	0.07	0.006
9	4.58 (0.76)	4.69 (0.85)	-0.11	6.48	0.01	0.011
10	5.00 (0.66)	5.11 (0.76)	-0.10	7.66	<0.01	0.013
11	5.21 (0.67)	5.48 (0.75)	-0.27	49.35	<0.001	0.078
12	5.69 (0.75)	5.89 (0.67)	-0.20	29.37	<0.001	0.048
13	6.22 (0.73)	6.32 (0.67)	-0.10	8.20	<0.01	0.014
14	6.73 (0.66)	6.79 (0.66)	-0.05	2.67	0.10	0.005
15	6.81 (0.93)	6.91 (0.55)	-0.10	5.82	0.02	0.010

Note: When objective progress was lower (1/15 to 5/15), more visual displays led to overestimation compared to more numerical displays. When objective progress was higher (6/15 to 15/15), more visual displays led to underestimation compared to more numerical displays. This pattern is broadly consistent with the visual moderation effect

Study 4b: The visual moderation effect affects behavioral intentions both when objective progress is low and high

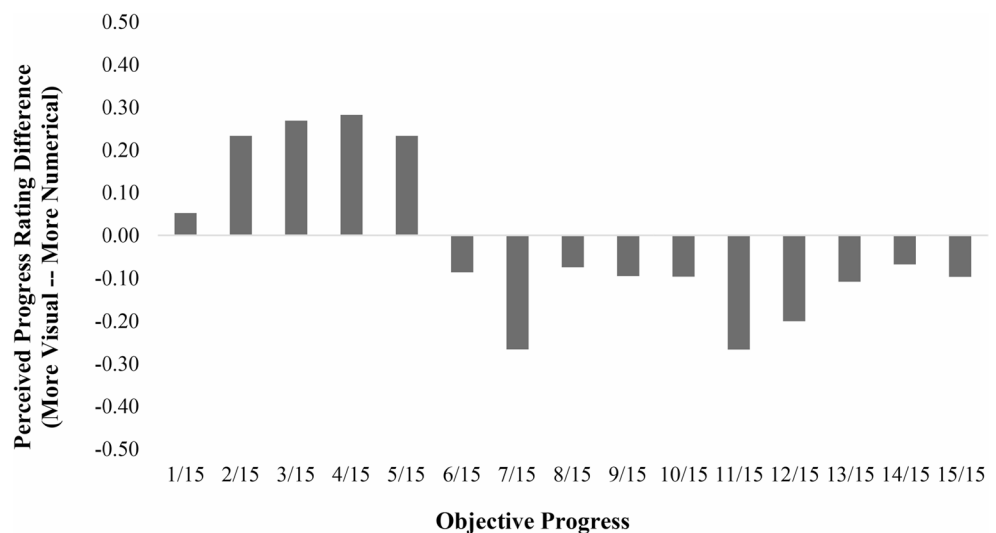
Whereas Study 4a provided evidence of the visual moderation effect on progress perceptions, both when objective progress was low and when it was high, Study 4b tests the full model while examining consumers' downstream behavioral intentions (i.e., both H2A and H2B). Consistent with H2A, we expect that when objective progress is low, LP-exposed consumers will be more likely to patronize the LP retailer in the future when progress is displayed more visually (vs. more numerically). Conversely, we anticipate

based on H2B that when objective progress is high, consumers will be likely to patronize the LP retailer when progress is displayed more visually (vs. more numerically).

Method

Sample and procedure Study 4b was preregistered (https://aspredicted.org/K58_WZT); the study was conducted with 361 undergraduate students from a large public university in the U.S. (50.7% female; $M_{\text{age}} = 20.33$, $SD = 0.99$). Participants were introduced to the same frozen yogurt from Study 4a (i.e., The Yogurt Shop) with an LP that encouraged consumers to purchase at the shop in exchange for rewards.

Fig. 5 Difference in perceived progress of more visual versus more numerical displays at each level of objective progress (Study 4a)



Participants were informed that in this special LP, they would earn a free yogurt after making 10 purchases.

All participants subsequently learned that after their last purchase at The Yogurt Shop, they went to the shop's app on their phone to check their loyalty program's progress. We varied the presented information according to each of the four assigned conditions. Participants in the more numerical display conditions were shown a screenshot of the app indicating that they had earned either 30% (low objective progress) or 70% (high objective progress) of the progress required to get a free yogurt. In turn, participants in the more visual display conditions viewed a screenshot of the same app showing a horizontal visual progress bar that indicated the same objective progress as in the two more numerical conditions (i.e., equivalent to 30% in the low progress condition and 70% in the high progress condition), but without explicitly showing any actual numbers.

All participants were then asked to respond to a behavioral intention measure that captured their likelihood to patronize the retailer in the future, which represents a variable highly relevant to managers. Specifically, we asked, "Given the points you have accumulated as displayed on the app, how likely are you to buy at The Yogurt Shop?" (0=extremely unlikely, 100=extremely likely).

Results and discussion

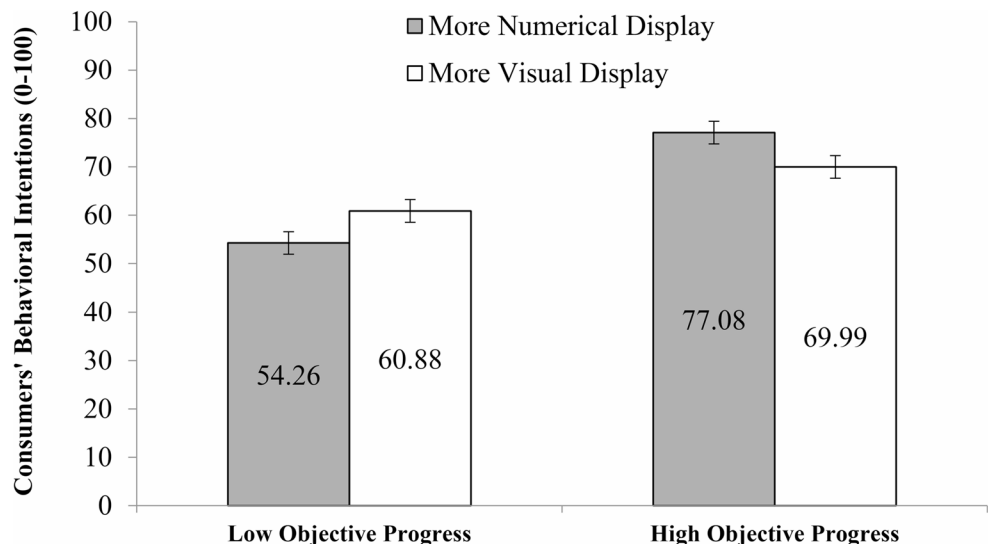
A 2 (display: more numerical, more visual) \times 2 (objective progress: low, high) between-participants ANOVA on the consumers' behavioral intentions measure revealed a main effect of objective progress ($F(1, 357)=46.57, p<.001, \eta_p^2=0.12$), such that participants in the high objective progress conditions ($M=73.53, SD=20.83$) reported higher

behavioral intentions than participants in the low objective progress conditions ($M=57.57, SD=23.91$). There was no main effect of LP display ($F(1, 357)=0.10, p=.75, \eta_p^2<0.001$). More germane to our theorizing, there was a significant interaction effect ($F(1, 357)=8.58, p=.004, \eta_p^2=0.023$). The contrasts (see Fig. 6) revealed that when objective progress was low, consumers reported greater behavioral intentions if LP progress was displayed more visually ($M_{\text{more visual}} = 60.88, SD=23.10$) compared to when it was displayed more numerically ($M_{\text{more numerical}} = 54.26, SD=24.36$); $F(1, 357)=4.01, p=.046, \eta_p^2=0.011$. In contrast, when objective progress was high, consumers' behavioral intentions were lower if LP progress was displayed more visually ($M_{\text{more visual}} = 69.99, SD=23.42$) as compared to when it was displayed more numerically ($M_{\text{more numerical}} = 77.08, SD=17.28$); $F(1, 357)=4.58, p=.033, \eta_p^2=0.013$. That is, consumers exhibited more moderate (i.e., less extreme) behavioral intentions when the same level of objective progress was displayed more visually versus more numerically. These findings are consistent with both H2A and H2B.

Study 5: More visual displays reduce confidence in progress made towards a reward, resulting in the visual moderation effect

In addition to replicating the visual moderation effect at both high and low levels of objective reward progress using a between-participant design, Study 5 provides additional evidence for our proposed mechanism. Specifically, as stated in H3, we suggest that consumers who encounter a

Fig. 6 Consumers' behavioral intentions are less extreme [more moderate] if the same level of objective progress is displayed more visually versus more numerically (Study 4b)



more visual LP display are less confident about their objective progress and therefore provide a more moderate progress estimate, in line with the centrality bias.

Method

Sample and procedure Study 5 was conducted online with 622 students at a large public university in the U.S. (55.1% female; $M_{\text{age}} = 20.15$, $SD = 1.27$) who participated in exchange for course credit. The study involved a 2 (display: more numerical, more visual) \times 2 (objective progress: low, high) between-participants design. Participants were introduced to Cascades Car Wash, a local car wash near their home that they visited regularly. They were informed that Cascades had an LP in which patrons downloaded an app and scanned it after every car wash. After every 15 car washes purchased, LP customers would receive a free car wash.

Participants subsequently learned that they had just stopped by Cascades to get their car washed, scanned their app to record their purchase, and received a notification a few minutes later indicating their progress toward the goal of a free car wash. We varied the presented information according to each of the four assigned conditions. Participants in the more numerical display conditions were shown a screenshot of the app indicating that they had earned either 4/15 (low objective progress) or 11/15 (high objective progress) paid car washes required to receive a free car wash. In turn, participants in the more visual display conditions viewed a screenshot of the same app showing a horizontal visual progress bar indicating the same objective progress as in the two more numerical conditions (i.e., equivalent to 4/15 in the low progress condition and 11/15 in the high progress condition), but without explicitly showing any actual numbers.

All participants were then asked to respond to three perceived progress measures. First, they reported -on sliding scales- how much overall progress they thought had been made towards their goal of reaching 15 car washes (0=very little, 100=a lot), 2) how pessimistic/optimistic they felt about reaching their goal of 15 car washes soon (0=very pessimistic, 100=very optimistic), and how far/close they were from their goal of reaching 15 car washes (0=very far, 100=very close). We averaged these three items to create a composite measure of perceived progress ($\alpha = 0.92$). Additionally, participants responded to two items that required them to provide specific progress estimates. They reported the number of car washes they thought they had purchased (0–15) and how many they thought they were away from earning a free car wash (0–15). We reverse-coded the second item and averaged these two items together to create a composite progress estimate measure ($\alpha = 0.96$).

Subsequently, participants were asked to provide answers to two confidence measures. They reported on sliding scales

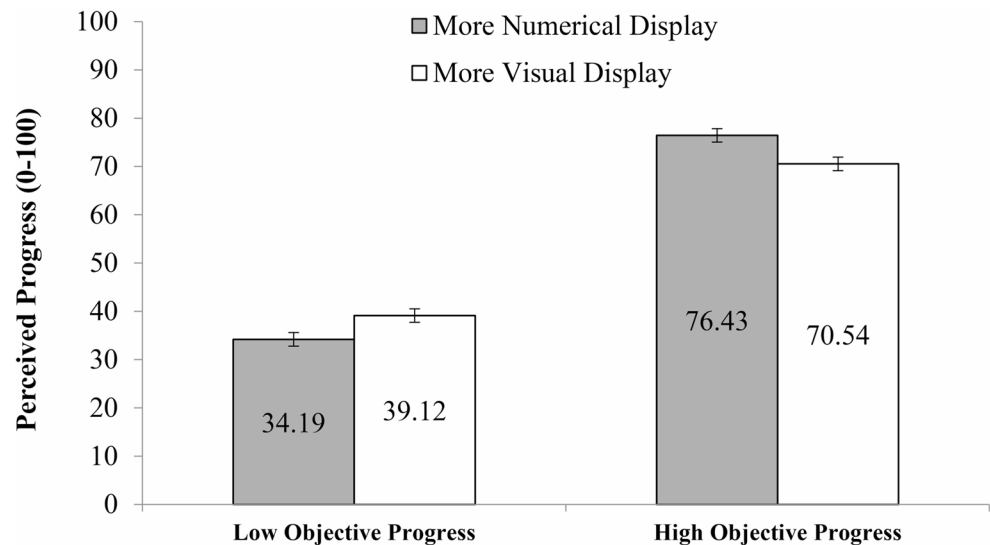
how ambiguous/clear the format used to describe their progress toward their next reward was (0=very ambiguous, 100=very clear) and how uncertain/certain they felt about the effort required to reach their free car wash (0=very uncertain, 100=very certain). We averaged these two items to create a composite measure of confidence ($r = .49$).

Results and discussion

A 2 (display: more numerical, more visual) \times 2 (objective progress: low, high) between-participants ANOVA on the perceived progress measure revealed a main effect of objective progress ($F(1, 618) = 692.51$, $p < .001$, $\eta_p^2 = 0.53$), such that participants in the high objective progress conditions ($M = 73.52$, $SD = 19.10$) estimated their perceived progress to be higher than participants in the low objective progress conditions ($M = 36.65$, $SD = 16.05$). There was no main effect of display ($F(1, 618) = 0.12$, $p = .73$, $\eta_p^2 < 0.001$). More germane to our theorizing, there was a significant interaction effect ($F(1, 618) = 14.94$, $p < .001$, $\eta_p^2 = 0.024$). The contrasts (see Fig. 7) revealed that when objective progress was low, consumers perceived their progress to be greater if it was displayed more visually ($M_{\text{more visual}} = 39.12$, $SD = 18.40$) compared to when it was displayed more numerically ($M_{\text{more numerical}} = 34.19$, $SD = 12.87$); $F(1, 618) = 6.22$, $p = .013$, $\eta_p^2 = 0.010$. In contrast, when objective progress was high, individuals perceived their progress to be lower if it was displayed more visually ($M_{\text{more visual}} = 70.54$, $SD = 21.76$) as compared to when it was displayed more numerically ($M_{\text{more numerical}} = 76.43$, $SD = 15.62$); $F(1, 618) = 8.83$, $p = .003$, $\eta_p^2 = 0.014$. That is, consumers perceived their progress to be more moderate (i.e., less extreme) when the same level of progress was displayed more visually versus more numerically. These findings are consistent with our proposal of a visual moderation effect of reward progress.

A 2 (display: more numerical, more visual) \times 2 (objective progress: low, high) between-participants ANOVA on the specific progress estimate measure revealed a similar pattern. There was a main effect of objective progress ($F(1, 618) = 912.70$, $p < .001$, $\eta_p^2 = 0.60$), such that participants in the high objective progress conditions ($M = 10.41$, $SD = 2.74$) estimated their progress to be higher than participants in the low objective progress conditions ($M = 4.42$, $SD = 2.18$). There was no main effect of display ($F(1, 618) = 0.05$, $p = .82$, $\eta_p^2 < 0.001$). More germane to our theorizing, there was a significant interaction effect ($F(1, 618) = 4.12$, $p = .043$, $\eta_p^2 = 0.007$). Although the contrasts were non-significant, when objective progress was low, consumers estimated their progress to be greater if it was displayed more visually ($M_{\text{more visual}} = 4.60$, $SD = 2.96$) compared to when it was displayed more numerically

Fig. 7 Consumers perceive their progress to be less extreme [more moderate] if the same level of objective progress is displayed more visually versus more numerically (Study 5)



($M_{\text{more numerical}} = 4.25$, $SD = 0.83$); $F(1, 618) = 1.62$, $p = .20$, $\eta_p^2 = 0.003$. On the other hand, when objective progress was high, individuals estimated their progress to be lower if it was displayed more visually ($M_{\text{more visual}} = 10.18$, $SD = 3.36$) as compared to when it was displayed more numerically ($M_{\text{more numerical}} = 10.63$, $SD = 1.94$); $F(1, 618) = 2.55$, $p = .11$, $\eta_p^2 = 0.004$.

A further 2 (display: more numerical, more visual) \times 2 (objective progress: low, high) between-participants ANOVA on the confidence measure revealed a main effect of objective progress ($F(1, 618) = 29.44$, $p < .001$, $\eta_p^2 = 0.045$), such that participants in the high objective progress conditions ($M = 77.46$, $SD = 22.26$) reported their confidence to be higher than participants in the low objective progress conditions ($M = 68.43$, $SD = 22.23$). As expected, there was a main effect of display ($F(1, 618) = 93.38$, $p < .001$, $\eta_p^2 = 0.131$), such that participants in the more visual display conditions ($M = 64.90$, $SD = 24.56$) reported their confidence to be lower than participants in the more numerical display conditions ($M = 80.99$, $SD = 17.32$). There was no significant interaction effect ($F(1, 618) = 0.78$, $p = .38$, $\eta_p^2 = 0.001$).

Mediation and moderated mediation analysis We theorize that because participants in the more visual display condition are less confident about their exact progress, they will be guided by the centrality bias and report their perceived progress as more moderate, irrespective of whether the objective progress is high or low. We tested this prediction using mediation analysis. First, we created an extremity score by taking the absolute value of the difference between participants' perceived progress ratings (between 0 and 100) and the scale midpoint (i.e., 50). Lower extremity scores indicate more moderate progress judgments, whereas higher extremity scores indicate more extreme progress judgments. Next, we conducted a mediation analysis using PROCESS

(model 4; Hayes, 2018). In this model, extremity score, display (0 = more numerical vs. 1 = more visual), and confidence served as the dependent variable (Y), independent variable (X), and mediator (M). We utilized bootstrapping with repeated extraction of 10,000 samples. As expected, the results of this analysis revealed that the inverse relationship between display (0 = more numerical vs. 1 = more visual) and extremity score was significantly mediated through confidence ($B = -2.86$, $SE = 0.46$; 95% CI = $-3.79, -2.01$).

As an additional analysis, we conducted a moderation mediation analysis using PROCESS (model 15; Hayes, 2018). In this model, perceived progress, display (0 = more numerical vs. 1 = more visual), objective progress level (0 = low vs. 1 = high) and confidence served as the dependent variable (Y), independent variable (X), moderator (W), and mediator (M). We utilized bootstrapping with repeated extraction of 10,000 samples. As previously noted, the more visual (vs. more numerical) display significantly reduced confidence, $b = -16.14$, $p < .001$. The index of moderated mediation was significant ($Index = -4.37$, 95% CI $[-6.86, -2.14]$), indicating that the strength of the indirect effect depended on objective progress level. Collectively, these results are consistent with H3, that is, the lower confidence of consumers who encounter a more visual LP display yields the visual moderation effect.

Study 6a: Test of the visual moderation effect with a weaker numerical representation

Study 6a has two main objectives. First, we aim to show robustness by testing for the visual moderation effect and the role of confidence using a different visual representation of loyalty reward progress, namely a circular progress ring

instead of a progress bar (i.e., bar chart). Second, we aim to examine display formats that are situated relatively closer to one another on the display format continuum. Specifically, our more numerical display condition in Study 6a uses a weaker manipulation than the one used in Studies 3, 4a, 4b, and 5, as it also features a visual progress ring.

Method

Sample and procedure Study 6a was conducted with 462 participants (48.7% female; $M_{\text{age}} = 27.56$, $SD = 8.57$) recruited through an online panel (Prolific). The study involved a 2 (display: more numerical, more visual) x 2 (objective progress: low, high) between-participants design. Participants were informed that they were members of an LP offered by a local restaurant. This program offered participants a reward (i.e., a free appetizer at the restaurant) once they spent \$100. Participants were then shown a progress indicator in the shape of a ring, partially shaded dark red, to indicate their current progress toward this goal. Participants were randomly assigned to an objective progress condition that visually showed low objective progress (i.e., 35% of the ring was shaded green) or high objective progress (i.e., 65% of the bar was shaded green). Participants in the more visual display condition received no other information. However, participants in the more numerical condition saw the shaded ring and were also informed that they had already spent either \$35 or \$65 out of the \$100 required for the reward (depending on their assigned objective progress condition). Although both visual and numerical information are present in the more numerical condition of this study, we contend that this representation is relatively more numerical than the strictly visual condition in which no numbers appear. A pre-test validated this assumption.⁶

Next, participants were asked to provide answers to three confidence measures. They reported how confident (1 = not very confident, 10 = very confident), sure (1 = not very sure, 10 = very sure), and certain (1 = not very certain, 10 = very certain) they were about the amount they had already spent out of \$100. We averaged these three items for a composite confidence measure ($\alpha = 0.93$).

Participants were then asked to respond to four perceived progress measures. They reported the portion of their LP goal achieved (1 = small portion, 10 = large portion), how much progress had been made (1 = very little progress, 10 = very much progress), how far/close they felt from reaching their goal (1 = very far, 10 = very close), and how

likely they would be to visit the restaurant soon to reach the loyalty program goal (1 = very unlikely, 10 = very likely). We averaged these four items on a composite measure of perceived progress ($\alpha = 0.87$).⁷

Results and discussion

A 2 (display: more numerical, more visual) x 2 (objective progress: low, high) between-participants ANOVA on the perceived progress measure revealed a main effect of objective progress ($F(1, 458) = 464.39$, $p < .001$, $\eta_p^2 = 0.50$), such that participants in the high objective progress conditions ($M = 7.35$, $SD = 1.15$) estimated their perceived progress to be higher than participants in the low objective progress conditions ($M = 5.01$, $SD = 1.19$). There was no main effect of display ($F(1, 458) = 0.14$, $p = .71$, $\eta_p^2 < 0.001$). More germane to our theorizing, there was a significant interaction effect ($F(1, 458) = 6.05$, $p = .014$, $\eta_p^2 = 0.013$).

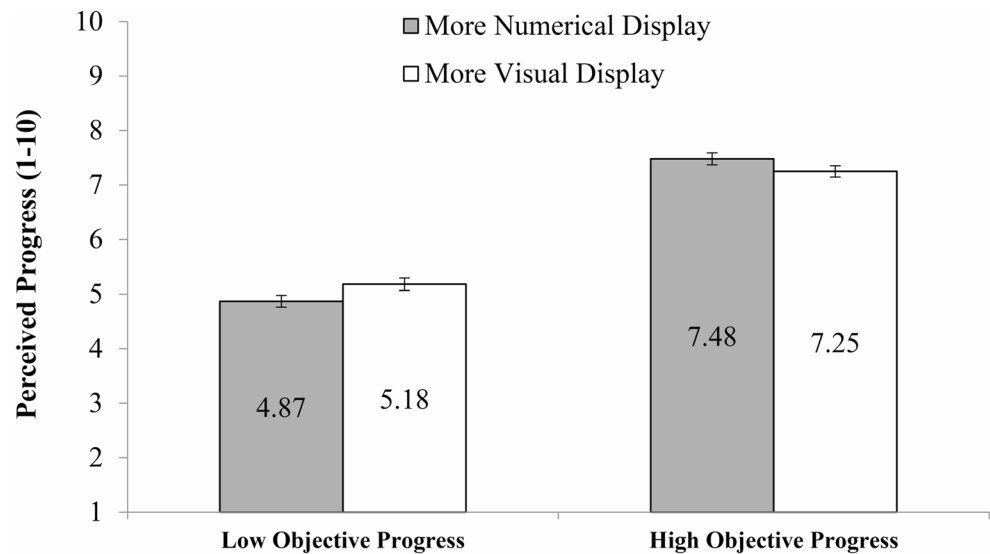
The contrasts (see Fig. 8) revealed that when objective progress was low, consumers perceived their progress to be greater if it was displayed more visually ($M_{\text{more visual}} = 5.17$, $SD = 1.34$) compared to when it was displayed more numerically ($M_{\text{more numerical}} = 4.87$, $SD = 1.03$); $F(1, 458) = 3.89$, $p = .049$, $\eta_p^2 = 0.008$. On the other hand, when objective progress was high, individuals perceived their progress to be greater if it was displayed more numerically ($M_{\text{more numerical}} = 7.48$, $SD = 1.11$) as compared to when it was displayed more visually ($M_{\text{more visual}} = 7.25$, $SD = 1.18$), although this contrast did not attain statistical significance; $F(1, 458) = 2.25$, $p = .135$, $\eta_p^2 = 0.005$. Generally, participants perceived their progress as more moderate (i.e., less extreme) when the same level of progress was displayed more visually versus more numerically. These findings are again consistent with our proposal of a visual moderation effect of reward progress.

A further 2 (display: more numerical, more visual) x 2 (objective progress: low, high) between-participants ANOVA on confidence revealed no main effect of objective progress ($F(1, 458) = 0.39$, $p = .53$, $\eta_p^2 = 0.001$). As expected, there was a main effect of display ($F(1, 458) = 64.36$, $p < .001$, $\eta_p^2 = 0.123$), such that participants in the more visual display conditions ($M = 6.94$, $SD = 2.00$) reported their confidence to be lower than participants in the more numerical display conditions ($M = 8.41$, $SD = 1.90$). There was no significant interaction effect ($F(1, 458) = 0.77$, $p = .38$, $\eta_p^2 = 0.002$).

⁶ A total of 47 pre-test participants (42.6% female; $M_{\text{age}} = 37.51$, $SD = 10.58$) rated the more visual display condition ($M = 15.27$, $SD = 19.09$) as more visual/less numerical than the more numerical display condition ($M = 56.89$, $SD = 21.20$), $t(46) = 11.37$, $p < .001$.

⁷ Since the fourth perceived progress item is more behavioral, we re-analyzed the data with this single item as the dependent measure. We also re-analyzed the data with a three-item composite measure of perceived progress ($\alpha = 0.95$) that excluded this more behavioral measure. The results were similar across all of these analyses.

Fig. 8 Consumers perceive their progress to be less extreme [more moderate] if the same level of objective progress is displayed more visually versus more numerically (Study 6a)



Mediation and moderated mediation analysis As in Study 5, we created an extremity score by taking the absolute value of the difference between participants' perceived progress rating (between 1 and 10) and the scale midpoint (i.e., 5.5). Lower extremity scores indicate more moderate progress judgments, whereas higher extremity scores indicate more extreme progress judgments. Next, we conducted a mediation analysis using PROCESS (model 4; Hayes, 2018). In this model, extremity score, display (0=more numerical vs. 1=more visual), and confidence served as the dependent variable (Y), independent variable (X), and mediator (M). We utilized bootstrapping with repeated extraction of 10,000 samples. As expected, the results of this analysis revealed that the inverse relationship between display (0=more numerical vs. 1=more visual) and extremity score was significantly mediated through confidence ($B = -0.09$, $SE = 0.04$; 95% CI = $-0.17, -0.02$).

As an additional analysis, we conducted a moderation mediation analysis using PROCESS (model 15; Hayes, 2018). In this model, perceived progress, display (0=more numerical vs. 1=more visual), objective progress level (0=low vs. 1=high) and confidence served as the dependent variable (Y), independent variable (X), moderator (W), and mediator (M). We utilized bootstrapping with repeated extraction of 10,000 samples. As previously noted, the more visual (vs. more numerical) display significantly reduced confidence, $b = -1.47$, $p < .001$. The index of moderated mediation was significant ($Index = -0.19$, 95% CI $[-0.40, -0.01]$), indicating that the strength of the indirect effect depended on objective progress level. These results provide further evidence in support of H3 –.

that is, the lower confidence of consumers who encounter a more visual LP display yields the visual moderation effect.

Study 6b: Test of the visual moderation effect with a weaker visual representation

In Study 6b, we again aim to examine display formats that are situated relatively closer to one another on the display format continuum. This time, our more visual display condition uses a weaker manipulation than we used in Studies 3, 4a, 4b, 5, and 6a in that it includes quantitative “markers” that could be counted by sufficiently motivated consumers who wanted to know exactly how much progress they had made (e.g., by counting blocks, wedges, holes in a punch card, or other visual markers).

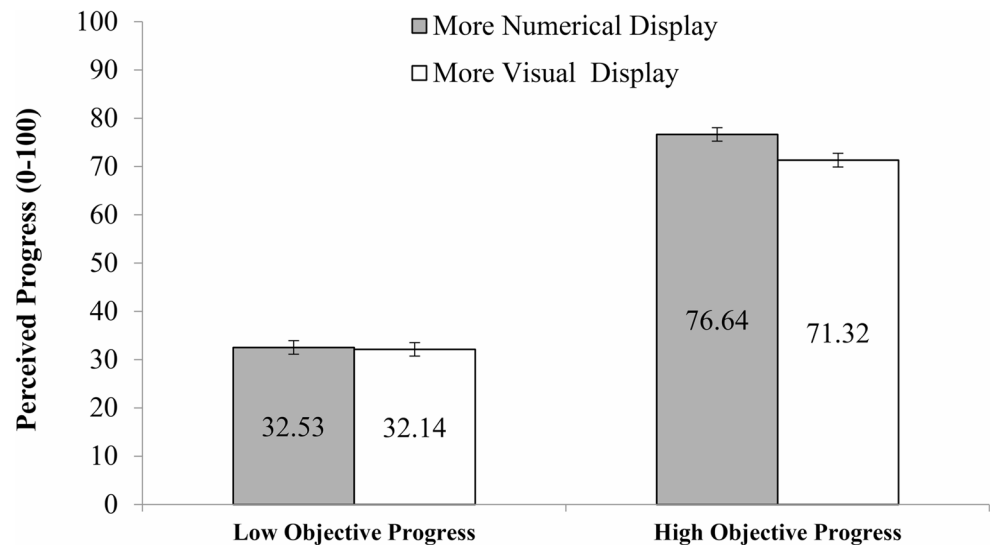
Method

Sample and procedure Study 6b was preregistered (<https://aspr.edicted.org/8dhq-std7.pdf>). For this study we recruited 565 students (59.8% female; $M_{age} = 20.26$, $SD = 1.46$) from a large public US university. The study involved a 2 (display: more numerical, more visual) x 2 (objective progress: low, high) between-participants design. We used the same stimuli employed in Study 5, with the only change being that the more visual progress bar displayed quantitative markers for each purchase, allowing sufficiently motivated participants to ascertain their progress quantitatively. Although both visual and quantitative information are present in the more visual condition of this study, we contend that this representation is relatively more visual than the strictly numerical condition in which no visual information appears. A pre-test validated this assumption.⁸

Participants reported on a sliding scale how much overall progress they thought had been made towards their goal of

⁸ A total of 47 pre-test participants (53.2% female; $M_{age} = 37.51$, $SD = 12.04$) rated the more visual display condition ($M = 27.03$, $SD = 17.05$) as more visual/less numerical than the more numerical display condition ($M = 76.10$, $SD = 17.41$), $t(46) = 11.78$, $p < .001$.

Fig. 9 Consumers perceive their progress to be less extreme [more moderate] if the high objective progress is displayed more visually versus more numerically (Study 6b)



reaching 15 car washes (0=very little, 100=a lot). We also included several exploratory items as potential covariates (i.e., membership in a loyalty program, car wash frequency, participant's mood and emotions).

Results and discussion

A 2 (display: more numerical, more visual) \times 2 (objective progress: low, high) between-participants ANOVA on the perceived progress measure revealed a main effect of objective progress ($F(1, 561)=1229.59, p<.001, \eta_p^2=0.69$) and display ($F(1, 561)=5.79, p=.016, \eta_p^2=0.010$). Importantly, we observed a significant interaction effect ($F(1, 561)=4.31, p=.038, \eta_p^2=0.008$). After including all our covariates, the interaction remained significant ($F(1, 561)=4.36, p=.037, \eta_p^2=0.008$). Contrast analysis (see Fig. 9) revealed that when objective progress was low, there were no significant differences between the more visual ($M_{\text{more visual}} = 32.13, SD=16.14$) and the more numerical ($M_{\text{more numerical}} = 32.53, SD=15.09$) conditions ($F(1, 561)=0.05, p>.05, \eta_p^2=0.000$). However, when objective loyalty progress was high, participants in the more visual condition perceived lower loyalty progress ($M_{\text{more visual}} = 71.32, SD=12.62$) compared to those in the more numerical condition ($M_{\text{more numerical}} = 76.64, SD=12.20$); $F(1, 561)=9.99, p=.002, \eta_p^2=0.018$. These results spotlight a potential boundary condition for our effect. When objective progress was low and a more visual representation included quantitative progress markers, the visual moderation effect was attenuated. This may be because loyalty program members could easily quantify their progress by counting a few progress markers. However, quantifying higher loyalty progress requires more cognitive resources (i.e., more counting); thus, individuals in the more visual condition seem to have made a more gestalt

judgment about their progress rather than actually counting each progress marker.

General discussion

Customers' perceptions of their progress toward a loyalty reward can greatly affect engagement (Bijmolt et al., 2018), reward-pursuit motivation (Förster et al., 1998; Hull, 1932; Kivetz et al., 2006), and even repurchase behaviors (Watson et al., 2015). Surprisingly, 57% of LP members in the United States are uncertain about their loyalty point balances, and 38% are unaware of the points needed to attain specific rewards (PR Newswire, 2017). This confusion may be partially attributable to existing industry practices in displaying loyalty reward progress, which vary dramatically across loyalty program platforms and digital apps (Belli et al., 2022; see also Pilot Study A and Web Appendix A). Such inconsistencies across LPs are likely to confuse customers (especially in the early stages of exposure to a particular LP), who tend to be members of multiple LPs simultaneously (The Bond Loyalty Report, 2024).

Against this backdrop, the primary objective of the present research was to examine how and why visual representations of loyalty reward progress influence consumers' interpretations of their objective progress and their LP-related behaviors and intentions. While past literature has generalized the manner (i.e., numerical information; Kivetz et al., 2006; Nunes & Drèze, 2006; Bagchi & Li, 2011) and means (i.e., traditional loyalty programs – physical cards; Ruan et al., 2024) in which reward progress information is offered to customers, we introduce a novel element that can lead consumers to differentially perceive loyalty reward progress based on how it is presented. In nine

studies, capturing field and lab data, we provide converging evidence of a *visual moderation effect* such that when consumers are shown more visual representations of loyalty reward progress, their progress estimates tend to be more moderate (i.e., less extreme). When objective progress is low, consumers presented with more visual indicators tend to overestimate their progress as being closer to the midpoint of a range (i.e., halfway to the reward). Conversely, when objective progress is high, more visual cues are likely to cause LP-exposed consumers to underestimate the progress toward the reward as being closer to the midpoint. We explain these findings by arguing that the ambiguity of visual displays of loyalty reward progress leads consumers to feel less confident, resulting in a visual moderation effect.

Our demonstration of this visual moderation effect is robust across (1) different visual formats (i.e., progress presented in a block bar chart, circular ring format, or with progress markers), (2) various LP contexts/categories (i.e., coffee shop, grocery store, frozen yogurt shop, car wash, restaurant), (3) different samples (online panel participants, university students, real loyalty program customers), (4) real (e.g., Starbucks, a local coffee shop) and fictitious brands, and (5) lab and field contexts.

To better assess the magnitude and robustness of the visual moderation effect, we conducted a single-paper meta-analysis (McShane & Bockenholt, 2017) of representation of loyalty reward progress on consumer judgments and behaviors across our relevant experiments (i.e., experiments for which we had a clear prediction for the comparison between more visual vs. more numerical for either low or high objective progress or both). At low levels of objective progress, the meta-analysis revealed that a *more visual* (vs. *numerical*) format significantly increases consumers' judgments and behaviors ($d=0.24$, $SE=0.05$; $z=4.81$, $p<.001$, 95% CI: [0.14, 0.33]). Conversely, at high levels of objective progress, the meta-analysis revealed that a *more numerical* (vs. *visual*) format significantly increases consumers' judgments and behaviors ($d=0.27$, $SE=0.05$; $z=4.96$, $p<.001$, 95% CI: [0.16, 0.38]). See Web Appendix E for additional detail on these meta-analyses and Web Appendix F for post-hoc power analyses for the studies in this paper.

Theoretical contributions

Our findings allow us to make three main theoretical contributions. First, we contribute to research on goal pursuit. The goal-gradient hypothesis (Hull, 1932; Kivetz et al., 2006) has shown that as progress toward a goal increases, motivation to attain that goal also increases. However, consumers lose motivation and feel “stuck-in-the-middle” when they are about halfway to achieving a goal (Bonezzi et al., 2011; Huang et al., 2012; Huang, 2018). Our work qualifies

these findings by showing that when objective progress is high, more numerical rather than more visual displays of LP reward progress are especially motivating for consumers. Thus, we add to goal pursuit research by demonstrating that perceptions of goal progress are influenced not only by the objective progress level but also by whether progress information is presented visually (vs. numerically), an important nuance that prior research had not explored.

Second, we integrate research on goal visualization (e.g., Cheema & Bagchi, 2011; Koo & Fishbach, 2012; Jia et al., 2023; Mousavi et al., 2024) with work on the centrality bias or central fixation bias (Atalay et al., 2012). Previous research has shown that ease-of-visualization enhances perceptions of proximity to a goal and intensifies goal pursuit (Cheema & Bagchi, 2011). Given that visual displays are, by definition, easier to visualize than numerical displays, one might therefore expect more visual displays to be more motivating than more numerical displays at all objective levels of goal progress. Instead, we find that because consumers who encounter more visual displays feel less confident about their level of progress, numerical displays actually outperform visual displays at higher objective progress levels. As we show, this is because consumers who lack confidence in their level of LP progress tend to focus on the midpoint (or central region) of a range, in link with research that has demonstrated a centrality bias or central fixation bias (Atalay et al., 2012) in other contexts.

Finally, our work contributes directly to academic research on LPs. Prior research in this space has primarily explored how various ways of presenting numerical information (Kivetz et al., 2006; Nunes & Drèze, 2006; Bagchi & Li, 2011) affect LP progress perceptions and motivation. We shed light on how LP-exposed customers behave when presented with equivalent loyalty reward progress information that is displayed in a more visual (vs. more numerical) fashion. By demonstrating how LP progress stage (i.e., initial vs. advanced) and information display (i.e., more numerical vs. more visual) interact to influence consumer judgments and motivations, we provide new insights about LP information processing that paint a fuller picture about how consumers process and respond to progress information in the context of LPs.

Managerial implications

Our findings also have notable managerial implications. First and foremost, marketers stand to benefit from the insights generated by this research, which are applicable to digital LP formats as well as paper-based punch cards (e.g., Ruan et al., 2024) and can potentially inform the design and gamification of future loyalty programs (Hofacker et al., 2016; Hwang & Choi, 2020). We show that LP customers perceive the same reward progress information differently depending

on the type of display used, which in turn impacts their intentions and behaviors in attaining a reward. To enhance purchase acceleration toward an LP reward, firms and brands should be cognizant of their customers' current stage in the reward progress journey and realize that employing a more visual display format during the relatively early stages of their reward progress and a more numerical display format during the relatively later stages is most effective at prompting LP customers to accomplish their reward objectives. As such, we provide actionable advice for marketers on how and when to strategically communicate reward progress to engage and motivate LP customers. Interestingly, the fact that more visual LP displays of progress may negatively affect LP customers who are objectively close to their reward is particularly problematic because customers who are closer to achieving a reward tend to be a firm's most loyal customers. This visual moderation effect may have negative repercussions for this group for at least two reasons. From a relationship marketing perspective (Khamitov et al., 2019), loyal customers who are unable to interpret and make sense of loyalty reward progress information accurately may be demotivated to engage with the firm (Bijmolt & Verhoef, 2017) as they cannot precisely ascertain whether their loyalty is being reciprocated. These recommendations are also applicable to consumer segmentation strategies. While it is possible that new or low-engagement customers may join a firm's loyalty program solely to take advantage of a sign-up incentive (rather than demonstrating genuine loyalty), a more visual approach to reward progress and information may help the firm engage and motivate these newer customers' repurchasing behaviors. Alternatively, it is in the firm's best interest to make established customers feel rewarded and valued. Reciprocity principles suggest that as customers receive these relational rewards, they will be more motivated to reciprocate to the firm. Hence, marketers can leverage a more numerical reward progress informational approach to motivate highly loyal customers to reach their reward goals.

Second, interpreting visual information in a way that makes consumers feel further away from their reward may demotivate LP customers to redeem these rewards when they ultimately qualify for them. A recent survey reveals that customers have accumulated \$100 billion worth of unredeemed loyalty points (PR Newswire, 2017). This is a problem, as firms may feel compelled to relieve themselves of the obligation to repay this "debt" to their customers. Based on our results, we advise marketers to present their most loyal customers (i.e., those close to attaining LP reward targets) with loyalty reward progress information that is unambiguously represented (i.e., more numerical), as this should attenuate the visual moderation effect.

Our findings may be valuable for firms to consider, even if they have already made the strategic decision to include more numerical information about reward progress in the consumers' apps. Prior research (Bagchi & Davis, 2012; Monnier & Thomas, 2022) has shown that the order of presentation and/or the salience of different formats or frames can affect consumer decision-making. Thus, firms may want to strategically consider whether more numerical information should be presented immediately on their app's home screen or if a more visual LP display should be presented first (with the revelation of full numerical information necessitating a few additional clicks). Based on our research, it is possible that firms might consider "leading" with a different format depending on an LP member's objective progress toward a reward. As such, firms can enhance their loyalty reward programs through behavioral nudges (i.e., reward progress designs) intended to guide consumers towards desired behaviors without restricting choice or altering economic incentives. Importantly, these nudges are likely to help firms avoid motivational drop-offs by keeping customers engaged during the middle stage of their reward progress journey, which is when motivation tends to dip.

Conclusions and future research

Overall, we provide converging evidence that a lack of confidence in evaluating one's progress toward a loyalty reward induces a visual moderation effect. This lack of confidence is more likely following exposure to an inherently ambiguous, more visual representation of reward progress. Our methodological approach includes within and between-subjects experimental designs, actual behaviors, behavioral intentions, and attitudinal variables, different operationalizations of more visual and more numerical LP displays, and various loyalty program contexts and industries. Although our studies provide converging evidence that visual displays lead consumers to make progress estimates that are closer to the midpoint of a range, future research may be able to provide additional nuance. For instance, when progress is depicted visually, is it the midpoint itself that attracts consumers' attention, or are consumers drawn to a broader region surrounding the midpoint?

Future research might also explore potential differences arising from goal-pursuit framing. For instance, our manipulations tended to follow a "to-date" framing approach by explicitly communicating or emphasizing the amount of loyalty reward progress customers had already achieved. It might be interesting to explore more visual representations depicting a "to-go" framing—focusing on what or how much is left until the LP reward target is achieved—to assess whether such a framing would strengthen or weaken this visual moderating effect.

Another avenue for future research involves exploring additional progress cues beyond those included in this study. While we attempted to generalize our findings depicting progress using different formats (i.e., block bar charts, circular rings), many LP reward apps use other visual representations (e.g., stars, hearts, company logos, etc.). Recent research has documented a visual rounding effect in which certain visuals that are partially filled in are perceived as more complete images (Jia et al., 2023). It would be beneficial to assess whether the visual moderation effect holds for certain visuals that may be more sensitive to this visual completeness restoration process, or if more visual displays of LP progress lead to higher progress perceptions for stars and related non-rectangular formats due to visual rounding.

A limitation of the present research is that it focused predominantly on contexts where consumers made purchase decisions soon after being provided information about their progress towards a loyalty reward. Thus, it is not clear whether our findings would hold in contexts where consumers make judgments and decisions long after they encounter a LP progress display. Future research might explore whether the visual moderation effect influences consumer response in delayed-purchase contexts.

Lastly, researchers could try to generalize our visual moderation effect across other contexts. Customers often wait while acquiring or consuming a product or service, and we know that wait-time and overall customer satisfaction are negatively correlated (Taylor, 1994; Kumar et al., 1997). In these wait-time contexts, the utilization of more visual representations across physical and digital settings is ubiquitous. Brick-and-mortar retailers, for instance, place video screens depicting estimated wait times until a service is rendered. In digital contexts, individuals are also exposed to visual representations of passing time, including the time needed to download a software program, a digital app, or a movie, as well as the time required to charge a laptop or a cell phone. To minimize the negative effects of waiting, firms might consider implementing more visual [more numerical] representations of progress earlier [later] in the waiting period for a service/product. Such an approach can minimize feelings of impatience and dissatisfaction among customers, assuming our effect generalizes to such contexts.

In sum, this research suggests that despite common practice, a “one size fits all” LP visual progress strategy may be ineffective for firms when deciding how to present customers with loyalty reward progress information. For firms employing LPs, it is just as important to keep customers motivated in the early stages of a reward program as it is to signal to returning customers that their personal and financial commitments to the firm are noted, appreciated, and reciprocated. By strategically utilizing more visual displays of reward progress over numerical ones, firms can better motivate and

mobilize their existing and prospective LP customers, ultimately achieving greater success in the marketplace.

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Declarations

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