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CAN JOY BUY YOU MONEY? THE IMPACT OF THE STRENGTH, DURATION, AND PHASES OF AN ENTREPRENEUR'S PEAK DISPLAYED JOY ON FUNDING PERFORMANCE

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Does displaying positive emotions (e.g., joy) during a funding pitch help an entrepreneur gain more financial support? Past research has approached this question mostly by treating emotional displays as static and focusing on the overall or average levels of displayed emotions. However, emotional displays are temporally dynamic and more salient in some moments or phases than others. Drawing from gestalt characteristics and event system theories, we take a dynamic approach to examine the "peak" moments of entrepreneurs' displayed joy—specifically, the strength and duration of peak displayed joy during different phases of a pitch. We analyzed data from over eight million frames in 1,460 pitch videos, using the latest facial expression analysis technology. The findings unveil the benefit of pitching with a greater level of peak displayed joy, especially during the beginning and ending phases of a pitch. Moreover, the amount of time an entrepreneur spends at the peak level of his or her displayed joy has an inverted *U*-shaped relationship with funding performance. This research highlights not only the importance of investigating emotion temporal dynamics in the interpersonal context, but also the unique research opportunities provided by facial expression analyses in understanding complex management phenomena.

A growing body of research has shed light on the roles of entrepreneurs' emotions in their entrepreneurial endeavors (Baron, 2008; Cardon, Foo, Shepherd, & Wiklund, 2012; Cardon, Wincent, Singh, & Drnovsek, 2009). Given the importance of raising capital to entrepreneurs, researchers have directed their attention toward understanding whether an entrepreneur's positive emotional displays during a funding pitch are related to the amount of capital acquired (Cardon, Mitteness, & Sudek, 2017; Chen, Yao, & Kotha, 2009; Li, Chen, Kotha, & Fisher, 2017; Murnieks, Cardon, Sudek, White, & Brooks, 2016). While prior studies have generated valuable insights, *temporal* features of entrepreneurs' emotional displays during a funding pitch remain understudied. Emotional displays are temporally dynamic; they change over time, with some emotional moments more salient than others (Ariely & Carmon, 2000; Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993). This suggests that the audience of a pitch may be more influenced by the emotional displays at some moments than at others. Thus, in line with recent emotion research's advancement toward treating emotions as unfolding and dynamic, rather than static, constructs (Barrett, 2013; Kuppens & Verduyn, 2017), we strive to develop a more dynamic view of an entrepreneur's displayed emotions during a funding pitch. As scholars have continued to emphasize, "time is crucial to understanding the field of management" (Shipp & Fried, 2014: 1).

Building on gestalt characteristics theory (Ariely & Carmon, 2000), we examine a novel and temporal feature of an entrepreneur's emotional displays: the "peak" moment (i.e., the moment when the intensity of an emotion is the highest). We focus on the

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discrete emotion of joy, because it is the most fundamental form of positive emotions (Ekman, 1992), and positive emotions are important for building relationships in interpersonal contexts (e.g., Staw, Sutton, & Pelled, 1994). We theorize that the level of displayed joy at its peak moment plays a critical role in influencing the level of funding support received from the audience (i.e., funding performance). We find compelling evidence for this influence even after controlling for other emotional features in an entrepreneur's pitch, as well as characteristics of the entrepreneurial project and the entrepreneur. Hence, departing from prior studies that have generally looked at the impact of a displayed emotion's overall or average level (Baron, 2008; Cardon et al., 2012; Chen et al., 2009), this research highlights a new way of studying the impact of displayed emotions. Investigating the peak of a presenter's emotional displays also opens up opportunities for future research to examine the disproportionate impacts that key moments of displayed emotions can have on persuasion outcomes.

Additionally, event system theory suggests that to more fully understand the influence of an event, scholars should not only examine the strength or intensity of an event (i.e., in this research, an entrepreneur's peak displayed joy) but also how long an event lasts (duration) and when it occurs (phase) (Morgeson, Mitchell, & Liu, 2015). George and Jones (2000) pointed out that time is intimately intertwined with the human experience. To build a stronger theoretical framework and to more thoroughly unveil the impact of an event, which inevitably evolves over time, researchers should account for the roles that the event's temporal factors play (Mitchell & James, 2001; Shipp & Cole, 2015). Therefore, in addition to considering the intensity of peak displayed joy, we study how long peak displayed joy should last in order to achieve the best outcomes. Specifically, we hypothesize an inverted *U*-shaped relationship between the total time length of peak displayed joy and funding performance. When the display of entrepreneurs' peak joy lasts longer than a certain duration, the audience may make certain negative inferences. As such, we highlight the potential negative implications of the duration of peak displayed joy. Moreover, we consider peak displayed joy in different temporal phases because event system theory suggests that individuals who experience the event may have distinct preferences and reactions at different phases (Morgeson et al., 2015). Accordingly, we delve into two key phases of a funding pitch: the beginning and ending. We hypothesize that due to primacy and recency effects (Li, 2010; Murdock, 1962; Peters & Bijmolt, 1997; Pinsker, 2011), the positive influence of the intensity of peak displayed joy and the inverted *U*-shaped effect of the duration of peak displayed joy should be especially prominent during the beginning and ending phases of a pitch. By simultaneously considering the intensity and temporal factors of peak displayed joy, our research is positioned to better unveil the impact of emotional displays over time.

Taken together, this study makes meaningful contributions to the emotion and entrepreneurship literatures by developing novel theoretical perspectives and utilizing advanced measurement and analytical strategies. First, our research breaks from the traditional *intrapersonal* approach of studying the impact of emotion temporal dynamics (e.g., Do, Rupert, & Wolford, 2008; Houben, Van Den Noortgate, & Kuppens, 2015; Kuppens & Verduyn, 2017), and adopts the *interpersonal* perspective to study the dynamic influence of one's displayed joy on stakeholders in an entrepreneurial context. Meanwhile, our research contributes to the literature on the interpersonal influence of displayed emotions (e.g., Cardon et al., 2017; Li et al., 2017; Staw et al., 1994) by utilizing the temporal dynamics perspective and fleshing out the roles of specific temporal dimensions (e.g., duration, and phase). As such, our research bridges two disparate but related research streams that focus either on the *temporal* dynamics of emotions or the *interpersonal* effects of emotions. Our inquiry may stimulate a new stream of studies that look into the interpersonal impact of one's changing emotional displays over time.

This research also contributes to the emotions literature in general by introducing a new measure of displayed emotions that leverages the latest facial expression analysis technology. Conventional measures of displayed or felt emotions have relied heavily on people's self-assessments (i.e., their retrospection and reflection [Schwarz, 1999]), which may suffer from various perception and method biases (e.g., fundamental attribution error, halo effect, common method bias [Podsakoff, MacKenzie, & Podsakoff, 2012]). Moreover, constantly capturing emotional dynamics during a pitch is challenging. If using the traditional self-assessment method, researchers would need to interrupt observers multiple times within a short span of time (e.g., as short as a few seconds) to assess their perceptions of emotions at different moments. Such interruptions could easily annoy participants and negatively affect

assessment quality. To address these concerns, we utilize the latest facial expression analysis technology available through FaceReader (Lewinski, den Uyl, & Butler, 2014; Loijens & Krips, 2018) to generate repeated measures of displayed joy during each frame of a pitch video. FaceReader capitalizes on advances in facial expression analysis techniques and artificial intelligence to automatically and collect and analyze facial expressions of human beings. As such, we were able to analyze over 8 million video frames from 1,460 pitch videos and measure entrepreneurs' displayed joy in a more accurate and refined manner. This novel and advanced method offers management researchers an effective and in-depth way of measuring emotional displays over time. Below, we review relevant literatures and develop theoretical arguments for our hypotheses.

LITERATURE REVIEW AND THEORY DEVELOPMENT

Attracting Financial Support Through Displaying Joy

In this study, we investigate the interpersonal influence of displayed emotions in an important entrepreneurial context: entrepreneurs pitching their business ideas to gain financial support from others. Attracting financial support is essential for entrepreneurs to get their startups off the ground (Drover, Busenitz, Matusik, Townsend, Anglin, & Dushnitsky, 2017). However, entrepreneurs typically face tremendous challenges in convincing investors to fund their early-stage ventures because of a lack of credibility or of evidence of profitability (Brush, Greene, & Hart, 2001). As such, it is critical to investigate the factors that can help entrepreneurs be more successful in attracting start-up funding (Drover et al., 2017; Shane & Cable, 2002; Tyebjee & Bruno, 1984). Most studies so far have focused on the qualities of venture projects (e.g., Hoenig & Henkel, 2015; Macmillan, Siegel, & Narasimha, 1985) or the qualifications of entrepreneurs (e.g., Baum & Silverman, 2004; Bruns, Holland, Shepherd, & Wiklund, 2008; Hsu, 2007). Some studies have ventured into the domain of entrepreneur emotions and suggested how entrepreneurs' internal feelings might influence their abilities to attract financial investments (e.g., Baron, 2008). Nevertheless, in an interpersonal context, such as pitching to the audience, it is entrepreneurs' displayed emotions, not felt emotions, that the audience directly observes and uses as inputs for judgment.

An emerging stream of research has thus begun to examine entrepreneurs' displayed emotions during a funding pitch (e.g., Cardon et al., 2017; Chen et al., 2009; Li et al., 2017). Displayed *positive* emotions, in particular, are prevalent and important for the pitching context, where people need to build positive relationships with and persuade the audience. Psychological research has shown that the display of positive emotions has various benefits in social interactions, such as bringing people closer, increasing enjoyment of social activities, and facilitating the formation of relationships (Staw et al., 1994; Waugh & Fredrickson, 2006). For instance, displaying joy helps service providers build more positive rapport with customers (Pugh, 2001). Moreover, studies have highlighted the persuasive role of positive emotions. For example, displaying joy helps salespersons persuade more customers to make a purchase (Sharma, 1999). Similarly, there has been a growing contention that displaying positive emotions is conducive to entrepreneurs persuading others to evaluate the entrepreneurs more favorably and provide more funding (Cardon et al., 2017; Li et al., 2017; Murnieks et al., 2016).

Following prior research on entrepreneurs' positive emotional displays, we focus on the display of an important discrete positive emotion, joy. Displayed joy refers to the happiness or pleasure expressed by the speakers. In this study, we focus on joy rather than other positive emotions (e.g., pride, love), because joy is the most common and fundamental positive emotion of the six basic emotions (the others being fear, anger, sadness, disgust, and surprise) (Ekman, 1992). Joy is also more universally observable and recognizable by audiences compared to other positive emotions. Unlike other positive emotions, joy has been reliably and readily linked to specific facial expressions (e.g., raising cheek and drawing the corners of the mouth back and up into a smile), and such associations have received unanimous and robust support from the emotion recognition research (Gosselin, Kirouac, & Doré, 1995; Kohler et al., 2004). Previous studies have also shown that joy is by far one of the most reliable emotions (along with disgust, contempt, and surprise) to detect using facial expression analysis techniques (Stöckli, Schulte-Mecklenbeck, Borer, & Samson, 2018). Other positive emotions, in contrast, often encompass subtle cognitive elements and differences (e.g., a sense of self-identity as a key element for passion [Cardon et al., 2009]) that

cannot be captured by observing the presenters' facial expressions.

Considering Both Strength and Temporal Dimensions of Displayed Joy

Departing from prior literature, we incorporate not only strength (or intensity) but also *temporal* dimensions of an entrepreneur's displayed joy during a pitch presentation. Clearly, there has been a lack of attention to temporal aspects of displayed emotions in prior research on emotional cues during a pitch (Cardon et al., 2017; Chen et al., 2009; Clarke, Cornelissen, & Healey, 2019; Murnieks et al., 2016). In fact, the majority of emotion research has treated emotions as static by studying the general or average level of emotional displays (Barrett, 2013; Boiger & Mesquita, 2012). However, it is important to examine temporal dynamics of emotional display, because, owing to the changing nature of one's emotions, the interpersonal influence of displayed emotions may vary from moment to moment as well (Hareli & Rafaeli, 2008). Emotion theorists have called for more attention to both strength and temporal dimensions of emotions by treating emotions as unfolding and dynamic (Houben et al., 2015; Larsen, Augustine, & Prizmic, 2009). In our context, a pitch or presentation is not a single snapshot, but an extended period in which displayed emotions can fluctuate. Neglecting time-related issues has the potential to result in inaccurate theorizing and questionable—if not erroneous—empirical findings (Cole, Shipp, & Taylor, 2016; Ployhart & Vandenberg, 2009). Thus, two intriguing questions on emotion and time need to be addressed in this research context: which unique strength feature beyond the average level of an entrepreneur's displayed joy may affect the audience's decision? What temporal features of displayed joy may influence the audience's decision?

To address these two questions, we draw from gestalt characteristics theory (Ariely & Carmon, 2000) and event system theory (Morgeson et al., 2015) to examine the impact of an entrepreneur's peak displayed joy level (a unique strength feature of emotional displays), as well as the total time length of these peak moments (a unique temporal feature of emotional displays). Moreover, we investigate the level and duration of peak displayed joy in two salient temporal phases of a funding pitch: the beginning and ending. We elaborate on our theory development in the following sections.

The Strength Level of Peak Displayed Joy

A series of studies in the domain of behavioral decision making have suggested that peak emotional moments may be particularly important in human experiences (Ariely & Carmon, 2000; Fredrickson & Kahneman, 1993; Kahneman et al., 1993). According to gestalt characteristics theory (Ariely & Carmon, 2000), the peak level of one's affective experience significantly shapes his or her summary evaluation of an event. This peak effect has been observed in various types of events, such as watching pleasant or horrifying films (Fredrickson & Kahneman, 1993), being exposed to uncomfortably cold water (Kahneman et al., 1993) or annoying noises (Schreiber & Kahneman, 2000), receiving medical treatments (Redelmeier & Kahneman, 1996), and consuming material goods (Do et al., 2008). A general consensus from these studies is that people's peak, rather than average, affect during their experienced events greatly shapes how they evaluate these events (Geng, Chen, Lam, & Zheng, 2013). One explanation pertains to self-relevance: peak represents the most personally relevant or meaningful moment in one's experience. For example, peak may gauge the capacity that a person has to cope with an affective event (e.g., how much pain a person can tolerate [Fredrickson, 2000]).[1]

Following gestalt characteristic theory, we focus on entrepreneurs' peak displayed joy (i.e., the highest level of joy displayed by entrepreneurs) in this study. However, we differ from prior studies in an important way. Prior studies on peak have generally been conducted in *intrapersonal* settings, examining how one's peak emotional experience influences one's *own* overall assessment of an event (e.g., Do et al., 2008; Fredrickson, 2000; Redelmeier & Kahneman, 1996). We do not attempt to replicate prior intrapersonal research to study how an entrepreneur's peak joy influences his

[1] In addition to peak, people's ending affect during an event can influence their assessment of the event through the recency effect (Murdock, 1962). That is, people tend to remember the recent moment more than the earlier moments. However, we choose to focus only on developing hypotheses about peak displayed joy while controlling for end displayed joy in all data analyses in order to develop a more focused and coherent model. A key contribution of this study is its examination of the temporal phases (i.e., beginning and ending phases) of peak displayed joy. It is, however, infeasible to develop hypotheses on the phases of end displayed joy, because end displayed joy occurs only at the final phase of the pitch.

or her own summary evaluation of pitching. Instead, extending gestalt characteristics theory and related research, we take an *interpersonal* approach to study how an entrepreneur's peak joy displayed in a pitch influences viewers' funding decisions.

We argue that peak displayed joy is crucial for predicting the audience's response to an entrepreneur's pitch presentation because peak displayed joy is particularly salient and memorable to the audience. Gestalt characteristics theory maintains that peak is one of the few salient stimuli that are *most memorable* to and thus encoded by people, therefore exerting a unique effect on people's summary assessment above and beyond the average or general state of all stimuli (Ariely & Carmon, 2000; Fredrickson & Kahneman, 1993; Kahneman et al., 1993). Visual selective attention theory also suggests that people pay most attention to the stimuli that are the most vivid and expressive, such as peak moments; greater attention in turn leads to better memory (Theeuwes, Atchley, & Kramer, 2000; Treue, 2003). Thus, the audience should notice and remember entrepreneurs' peak displayed joy better than the displayed joy in other moments.

Since displayed joy at its peak moment is particularly noticeable and salient, the intensity of peak displayed joy should have a distinct influence on the audience's response to the pitch. For instance, the audience may feel more joyful when they see a stronger peak displayed joy. This can happen through emotional contagion, which describes a situation where an observer of another person's emotional expressions automatically mimics the expressions (e.g., one smiles when seeing others smile), and this mimicry reaction can lead the observer to feel the same emotion him- or herself (Flack, 2006; Hatfield, Cacioppo, & Rapson, 1993). Emotional contagion is particularly strong when the displayed emotions are highly expressive (Sullins, 1991), which is the case when the emotions are at peak levels. Hence, stronger peak displayed joy by an entrepreneur renders the audience more subject to emotional contagion, leading them to get caught up in the joy of the entrepreneur (Hatfield et al., 1993; Van Kleef, Homan, & Cheshin, 2012). The joyful feeling of the audience can, in turn, color their evaluation of the venture. Past studies have shown that one's positive emotions, such as joy, can reduce one's deliberation in decision making (Park & Banaji, 2000) and lead one to cultivate favorable decisions (Sinclair & Mark, 2008). An attribution process may take place in this context as well. The audience attributes their activated joy to a positive feeling toward the entrepreneur, which leads them to more strongly support the entrepreneur. In fact, such an attribution process has been repeatedly observed in the psychology literature: when an emotional cue triggers a person's affect, the person will attribute his or her affect at that moment to the judgment of a target (Oikawa, Aarts, & Oikawa, 2011; Schwarz & Clore, 1983).

Moreover, research on the interpersonal impact of displayed emotions has suggested that when an observer pays attention to another person's emotions, the observer will not only mimic the other's expressions but will also infer or interpret the emotions related thereto (Hareli & Rafaeli, 2008; Van Kleef et al., 2012). Peak displayed joy, which is particularly noticeable and memorable, is most likely to guide viewers to infer the entrepreneurs' qualities. For instance, according to Fredrickson's (2001) broaden-and-build theory, joyful people appear to have a better chance of success in the long run, because joy can broaden one's vision, enhance one's ability to absorb information, and encourage novel and varied thoughts and actions. Such a broadened cognitive and behavioral repertoire leads one to develop stronger skills and accumulate more resources over time. All these characteristics are considered important for a successful career (Fredrickson, 2001). Therefore, when observing an entrepreneur's stronger peak displayed joy, viewers are more apt to conclude that the entrepreneur has good potential for success, thereby investing more in the entrepreneur's venture. Taken together, the above theorizing indicates the following:

Hypothesis 1. During a venture project's fundraising pitch, the level of an entrepreneur's peak displayed joy is positively related to funding performance.

The Total Length of Time for Peak Displayed Joy

In this study, we advance the literature by drawing from event system theory (Morgeson et al., 2015) to probe into a unique temporal aspect of peak displayed joy: the total length of time for displaying peak joy. Event system theory has pointed out that events (e.g., peak joy moments during an entrepreneur's funding pitch) are bounded in time (Morgeson et al., 2015). Therefore, to develop a refined view of the impact of events, researchers should not only consider the strength or intensity of the events but also take into account how long the events last

(i.e., the total length of time for peak displayed joy moments [Morgeson et al., 2015]). In fact, related research has shown that, holding constant the strength level of an event, the event's duration also matters (Morgeson & DeRue, 2006). Interestingly, while gestalt characteristic theory has also looked at event duration, it has generally focused on the duration of the entire experience and underscores the existence of "duration neglect" (Fredrickson & Kahneman, 1993). That is, people tend to neglect how long the entire event lasts and instead rely on other gestalt characteristics (e.g., peak) as a proxy to summarize their experiences of the event (Ariely & Carmon, 2000). Nevertheless, one study found that an increased amount of time spent on *peak* discomfort will lead to less favorable retrospective evaluations (Schreiber & Kahneman, 2000). Thus, integrating event system and gestalt characteristics theories, we contend that the duration of an entrepreneur's peak displayed joy moments in a fundraising pitch may affect the funding outcome.

Specifically, we propose that the total length of an entrepreneur's peak displayed joy moments has an inverted *U*-shaped relationship with funding performance. In other words, funding performance may improve with peak time length; however, beyond a certain duration, the longer the peak, the worse the funding performance. On the one hand, event system theory suggests that the longer an event lasts, the more impactful it becomes (Morgeson et al., 2015). In a field study, Morgeson and DeRue (2006) demonstrated that when a team's disruptive event lasts longer, it is more taxing on the team. Similarly, in our study context, the longer an entrepreneur expresses joy at the peak level, the more impactful the peak displayed joy can become, because a longer peak duration helps to capture greater attention of the audience to peak displayed joy. With greater attention paid to peak displayed joy, the audience will be more subject to emotional contagion, get caught up in the entrepreneur's joyful speech, and make favorable inferences regarding the entrepreneur. Subsequently, they will invest more money in the associated entrepreneurial project.

On the other hand, beyond a certain threshold, the more time an entrepreneur expresses peak joy, the more likely it is to backfire. When peak displayed joy is overly long, the audience may instead develop negative inferences about it. Observers' interpretations of a positive emotion can be negative when they perceive the emotion as inappropriate (Hareli & Rafaeli, 2008; Van Kleef et al., 2012). Specifically, when entrepreneurs spend too much time expressing joy at the peak level, the audience may infer that the entrepreneurs are overly confident about their projects. Overconfidence has been related to various issues, such as failure to see deficiencies and problems, and weak motivation or ability to observe changes in the environment and make appropriate adjustments (Shipman & Mumford, 2011). Additionally, the audience may view an entrepreneur who pitches with prolonged peak joy as behaving abnormally and unprofessionally. A brief moment of peak joy may be attractive and effective, as viewers may interpret it as a burst of the entrepreneur's positivity. However, an entrepreneur's prolonged display of peak joy may make the audience feel uncomfortable and resistant. Throughout a professional decision-making process, individuals are expected to contain emotional influence in order to make rational judgments (Smith & Kleinman, 1989). When exposed to long periods of peak displayed joy, pitch viewers may become cautious about the excessive emotional influence from the pitching entrepreneur and start reacting negatively.[2] Taken together, the following stands to reason:

Hypothesis 2. During a venture project's fundraising pitch, the total length of time in which an entrepreneur displays joy at its peak level has an inverted U*-shaped relationship with funding performance.*

The Temporal Phases for Peak Displayed Joy

Event system theory and research have posited that external stimuli with the same level of intensity, but appearing at different temporal phases, may have distinct impacts on individuals (Liu, Fisher, & Chen, 2018; Morgeson et al., 2015). In particular, the beginning and ending phases of a funding pitch play a salient role due to primacy and recency effects (Li, 2010; Pinsker, 2011). Scholars have found that when a person is given a list of unrelated items (e.g., words, facts, or behaviors) and later asked to recall that information, the person is more likely to recall the items at the beginning and at the end (known as primacy and recency effects, respectively) than the items in the middle (Murdock, 1962). The primacy effect can be attributed to the greater amount of cognitive rehearsal (i.e., thinking in one's mind) devoted to the first few

[2] Prolonged peak joy display may also engender an impression that the pitch is manipulative (Weber & Wirth, 2013). As a result, viewers may suspect that the entrepreneur's peak displayed joy is actually a strategic tactic for increasing the odds of fundraising success (Campbell & Kirmani, 2000).

items since people can continue to think about these items while observing the remaining ones (Rundus, 1971; Rundus & Atkinson, 1970). Extra thought paid to the first few items also makes them more likely to be transferred from the short-term to long-term memory (Atkinson & Shiffrin, 1971; Cowan, 2008), leading to superior recall of these items. The recency effect may arise because the last few items (i.e., those at the ending phase) are more likely than earlier items to remain in the limited-capacity short-term memory, which is relatively easy to access for information retrieval (Glanzer, 1972; Waugh & Norman, 1965).

Another explanation for primacy and recency effects is that items at the beginning and the end are more distinctive than those in the middle, thus receiving greater attention and becoming more memorable (Johnson, 1991; Murdock, 1960). For instance, research on the fresh-start effect has suggested that people view the beginning stage of a task as special and thus devote more attention and resources to it; the attention generally fades away over time as people get tired of the task or find it too hard to maintain (Dai, Milkman, & Riis, 2014). Marketing research has suggested that advertising audiences often use the first few seconds of an advertisement to decide whether to continue to watch it; as such, the first portion of an advertisement is critical for captivating the viewers' attention (Teixeira, Wedel, & Pieters, 2012). Items at the end of a list have also been viewed as more distinctive than those in the middle (Bower, 1971; Crowder, 1993), resulting in more attention to and better recall of the last few items (Baddeley, 1990; Glenberg & Swanson, 1986).

The above theorizing and evidence suggest that peak displayed joy and its duration at the beginning and ending phases of a funding pitch can be particularly influential for shaping people's impression and evaluation about the associated entrepreneurial project. Therefore, we suggest that the proposed effects of an entrepreneur's peak displayed joy in Hypotheses 1 (concerning peak level) and in Hypothesis 2 (concerning peak duration) will be especially salient during the beginning and ending phases of a funding pitch.

Hypothesis 3a. The level of an entrepreneur's peak displayed joy at the beginning phase of a venture project's fundraising pitch is positively related to funding performance.

Hypothesis 3b. The level of an entrepreneur's peak displayed joy at the ending phase of a venture project's fundraising pitch is positively related to funding performance.

Hypothesis 4a. The total length of time during which an entrepreneur displays joy at the peak level during the beginning phase of a venture project's fundraising pitch has an inverted U*-shaped relationship with funding performance.*

Hypothesis 4b. The total length of time during which an entrepreneur displays joy at the peak level during the ending phase of a venture project's fundraising pitch has an inverted U*-shaped relationship with funding performance.*

METHODS

Empirical Context and Sample

We examined our hypotheses in the context of crowdfunding, in which entrepreneurs present their project ideas to the public on the Internet (i.e., crowdfunding backers) to solicit funding. We chose this context because entrepreneurs' emotional displays are particularly relevant in attracting crowdfunding backers (Allison, Davis, Webb, & Short, 2017; Li et al., 2017). Compared with professional investors, crowdfunding backers are more apt to be swayed by the displayed emotions of entrepreneurs, due to their lack of motivation or ability to critically evaluate ventures (Li et al., 2017). Thus, studying how entrepreneurs can better manage their emotional expressions to raise financial resources is particularly relevant in the crowdfunding context. Moreover, crowdfunding is a practically important context because it is often more accessible to entrepreneurs compared to traditional funding sources (Mollick & Nanda, 2015). Crowdfunding is also growing rapidly. In 2015 alone, $34.4 billion dollars was raised through crowdfunding (an increase of 112% over 2014 [Massolution, 2015]), and this market is expected to grow by $89.72 billion during 2018–2022 (Technavio, 2018).

Our sampling procedure began with all 4,019 projects that were listed for funding across all categories of Kickstarter (one of the biggest crowdfunding platforms) on a randomly selected date, October 7, 2015. Among them, 1,645 projects included pitch videos and showed entrepreneurs' visible facial expressions for more than one second, with an average duration of 75 seconds. Because videos with entrepreneurs' faces showing up too briefly did not allow us to obtain meaningful variance of joy during the video, we used the 10th percentile (7.55 seconds) as the cutoff and only analyzed videos that displayed entrepreneurs' faces over 7.55 seconds. We further eliminated 10 projects with extreme funding goal

values (three goals below $100, and six goals above $1 million) as such projects often represented frivolous efforts to raise funds (Mollick, 2014). Additionally, 11 projects with missing data for control variables were not included in the analyses. Thus, our final sample included 1,460 entrepreneurial projects.

Measurement of Emotional Expressions

Testing our hypotheses required capturing the dynamic unfolding of joyful expressions in each project's pitch video. To achieve this goal, the most suitable method was deemed to be facial expression analysis, which measures displayed emotions through analysis of facial expressions (e.g., the movement of facial muscles in the lips and eyes).[3] Facial expressions are considered the universal language of emotions across cultures (Ekman, Friesen, O'Sullivan, Chan, & Mitchener, 1987). Through a systematic analysis of facial expressions, Ekman and Friesen (1978) developed the Facial Action Coding System (FACS) for measuring facial movement. FACS describes visually discernible facial movements through 44 unique "action units," defined as a contraction or relaxation of one or more facial muscles. By adding or combining these action units, FACS enables the objective measurement of facial movement (Ekman & Rosenberg, 1997). One particular application of FACS is to measure emotions by associating certain combinations of facial action units with specific emotions (Friesen & Ekman, 1983). For example, displayed joy is characterized mainly by the presence of two action units, cheek raiser and lip corner puller, and this association has received robust support in emotion recognition research (see Gosselin et al., 1995; Kohler et al., 2004).

In this study, we rely on an *automated* facial expression analysis technology to quantify our emotional variables. Historically, facial expression analysis largely relied on trained FACS experts to manually code facial actions picture by picture or frame by frame. This process is not only excruciating but also subject to human error and bias, thereby preventing the wide adoption of facial expression analysis in emotion research. Fortunately, facial expression analysis can now be accomplished via automated facial expression analysis technologies, which complete the analysis by utilizing the latest computer vision and machine learning methodologies, and big data analytics (Loijens & Krips, 2018). To date, the most widely used tool for automated facial expression analysis is FaceReader, which has been used by over 900 universities, research institutions, and companies worldwide in a variety of research areas, such as psychology (e.g., Fanti, Kyranides, & Panayiotou, 2015), education (e.g., Harley, Bouchet, Hussain, Azevedo, & Calvo, 2015), and marketing (e.g., Chan, Van Boven, Andrade, & Ariely, 2014).

Moreover, FaceReader's emotion metrics have been extensively validated in recent research. For instance, studies have found that FaceReader is more accurate in recognizing emotions compared to human coders. In one study, whereas human coders were able to classify 82–87% of common emotions in the publicly available standard databases of facial expression pictures, FaceReader was able to correctly identify 88–89% of basic emotions from the same databases (Lewinski et al., 2014). As a comparison, an alternative facial expression analysis software, AFFDEX, recognized 66–73% of the emotions in these databases.[4] Among different emotions,

[3] An alternative would be asking human coders to report their perceptions of displayed joy in a video. However, this approach is not very effective for capturing moment-by-moment joyful expressions in a video, and is subject to human perception bias. Other more objective methods that can capture moment-by-moment emotional changes, such as psychophysiological measures (e.g., skin conductance and facial electromyography) and the emerging neuroscience tools (e.g., functional magnetic resonance imaging), require physically attaching tools to a person's body to detect the person's emotions. Such methods are not applicable to capture emotional expressions in videos.

[4] In addition to FaceReader, there are two other popular pieces of software for automated facial analysis: Affectiva AFFDEX and Emotient FACET. We chose FaceReader because of the comprehensiveness of its measurement approach. FaceReader constructs an accurate 3D face model based on a complete set of over 500 key identification points on the face (Lewinski et al., 2014), whereas Affectiva AFFDEX and Emotient FACET build face models on the basis of fewer than 40 identification points (Stöckli et al., 2018). Emotient FACET is no longer commercially available, after it was acquired by Apple in 2016. The remaining preacquisition copies of Emotient FACET no longer receive updates or support from Emotient or Apple. Thus, the performance of an outdated Emotient FACET compared with an updated version of AFFDEX (released in 2017) or FaceReader (version 7.1 in 2017) is unknown. Finally, we found several empirical validation efforts for FaceReader published in peer-reviewed scholarly journals, as indicated in the paper, whereas very little research has been published regarding AFFDEX.

FaceReader is best able to recognize joy, with an accuracy rate of 96–100% (Loijens & Krips, 2018). Additionally, researchers have tested the validity of FaceReader in capturing facial actions against facial electromyography data, which is a widely used method to precisely capture facial muscles' contractions and forces through placing electrodes over specific muscles of the face (Lawrence & De Luca, 1983). FaceReader's measurement of joy was strongly correlated with the activity of zygomaticus major (median correlation = .723, $p < .001$), which is the cheek muscle that can draw the corners of the mouth back and up into a smile (an essential and defining feature of joyful facial expressions) (D'Arcey, Johnson, & Ennis, 2012). This finding provides strong evidence for the validity of FaceReader in measuring joy.

Measures

Funding performance. We measured a project's funding performance using two variables: (1) the *number of backers* who pledge money to the project and (2) the total amount of funding in U.S. dollars pledged by backers (i.e., *funding amount*). Note that while the *number of backers* captures the audience's decision to support the project, the *funding amount* captures the level of support from the audience. Compared to the number of backers, funding amount is a more refined measure of success or failure in fundraising on Kickstarter, and has more practical implications for entrepreneurs. Due to the skewness of both variables and their nonnegative nature, we took the natural log before entering them into the analyses (Keene, 1995).

Peak displayed joy. Using FaceReader, we thin-sliced each video into frames, with each frame lasting approximately one tenth of a second (the exact length per frame depends on the frame rate of the video itself). Together, there are over 8.2 million frames across all 1,460 videos, and each video has 5,618 frames on average. For each frame, FaceReader analyzed the facial expressions and calculated the intensity of joy based on the FACS coding rules (Ekman & Rosenberg, 1997; Friesen & Ekman, 1983). Hence, we were able to obtain an objective score for displayed joy ranging from 0 to 10 for each video frame in which facial expressions were visible.[5] Each video has an average of 2,323 frames with visible facial expressions. For each video, we identified the highest displayed joy score within all frames of the video as the *peak displayed joy*. As shown in Table 1, *peak displayed joy* on average is at 7.77 on a 10-point scale.

Peak displayed joy duration. Peak duration refers to the total length of time (in seconds) during which the entrepreneurs' displayed joy reaches the peak level during the pitch. We computed this variable by first counting the number of video frames in which the displayed joy level reaches the highest level within a video. Then, based on how long each frame lasts for that particular video, we converted the frame count into seconds.

The beginning, ending, and middle phases' peak displayed joy. To compute peak displayed joy in the beginning, ending, and middle phases of the pitch, we partitioned each pitch video into three parts: the beginning phase as the first third partition of the pitch video, the ending phase as the last third, and the middle phase as the remaining partition. We then identified the intensity and duration of peak displayed joy in each of the three partitions. In a robustness check, we also reran the analyses with the beginning and ending phases as the first and last quarter partitions of a pitch video.

Control variables. We first controlled for a set of pitch-related variables that may influence pitching outcomes. These include the trajectory of displayed joy during the pitch (*joy trajectory*), which describes the extent to which displayed joy increases or decreases over time. According to prior studies, state trajectory is another important gestalt characteristic that people rely on when summarizing prior experiences (Ariely & Carmon, 2000; Ariely & Zauberman, 2003). Following Bliese and Ployhart (2002) and others (e.g., Liu, Mitchell, Lee, Holtom, & Hinkin, 2012), we computed the trajectory of displayed joy for each video across all frames as the Bayes slope estimate. Additionally, according to gestalt characteristics theory, ending moments can also significantly shape people's memory (Fredrickson & Kahneman, 1993); hence, we controlled for the *last-second displayed joy*, which is the joy level in the last second when entrepreneurs showed up in a pitch video. Similarly, we controlled for *first-second displayed joy*, which is the joy level in the first second when entrepreneurs showed up in a pitch video. To take into account displayed joy in other moments, we further included the average level of joy displayed across all frames in a video (*average displayed joy*). Next, we computed the levels of the four basic negative emotions (fear, anger,

[5] The original score ranges from 0 to 1; however, for ease of interpretation, we rescaled this score by multiplying it by 10, so that the score ranges from 0 to 10.

TABLE 1
Descriptive Statistics and Correlations

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10
1.	Funding amount (log)	7.43	3.01										
2.	Number of backers (log)	3.56	1.91	0.93**									
3.	Peak displayed joy	7.77	2.24	0.14**	0.14**								
4.	Beginning phase's peak displayed joy	6.14	2.96	0.11**	0.11**	0.68**							
5.	Middle phase's peak displayed joy	5.77	3.03	0.06*	0.06*	0.63**	0.38**						
6.	End phase's peak displayed joy	6.04	3.00	0.11**	0.12**	0.66**	0.38**	0.45**					
7.	Peak duration	0.19	0.40	0.01	0.00	0.11**	0.09**	0.10**	0.11**				
8.	Beginning phase's peak duration	0.17	0.43	−0.04	−0.03	−0.03	0.00	0.00	−0.01	0.43**			
9.	Middle phase's peak duration	0.17	0.58	−0.03	−0.04	−0.09**	−0.05†	−0.03	−0.05*	0.32**	0.15**		
10.	Ending phase's peak duration	0.17	0.56	−0.02	−0.03	−0.08**	−0.03	−0.05*	−0.01	0.23**	0.05*	0.13**	
11.	Displayed joy trajectory	0.00	0.04	0.01	0.02	0.01	−0.16**	0.06*	0.15**	0.02	0.03	0.00	0.03
12.	Last-second displayed joy	2.90	2.79	0.05†	0.06*	0.39**	0.26**	0.24**	0.54**	0.12**	0.02	−0.02	0.02
13.	First-second displayed joy	2.49	2.65	0.07**	0.07**	0.33**	0.48**	0.16**	0.21**	0.11**	0.04	−0.03	0.01
14.	Average displayed joy	1.94	1.35	0.07**	0.09**	0.52**	0.47**	0.46**	0.47**	0.26**	0.08**	0.00	0.05*
15.	Average displayed negative emotions	0.64	0.29	−0.03	−0.04†	−0.24**	−0.22**	−0.20**	−0.24**	−0.10**	−0.05†	0.09**	0.03
16.	Video length	199.37	138.68	−0.12**	−0.09**	0.19**	0.16**	0.21**	0.17**	0.02	−0.02	−0.02	−0.01
17.	Video length with facials	82.19	91.94	−0.18**	−0.17**	0.11**	0.15**	0.17**	0.18**	0.06*	0.04†	0.03	0.04
18.	Funding goal (log)	9.17	1.38	0.23**	0.21**	0.07**	0.05†	0.05*	0.05†	0.02	0.00	−0.02	0.00
19.	Funding duration	35.01	10.62	−0.14**	−0.14**	0.01	0.00	0.00	0.01	0.02	−0.02	−0.02	0.03
20.	Popular location	0.17	0.37	0.11**	0.11**	0.05*	0.06*	0.05†	0.07**	−0.02	−0.01	0.02	−0.02
21.	Reward levels	10.14	7.27	0.41**	0.42**	0.10**	0.07*	0.08**	0.08**	0.05†	0.01	0.01	−0.01
22.	Prior projects funded	0.50	1.91	0.14**	0.18**	−0.03	−0.03	−0.09**	−0.04	−0.04	−0.02	−0.02	−0.02
23.	Prior backing experiences	9.78	41.70	0.12**	0.16**	0.03	0.05†	−0.02	0.05*	−0.02	−0.01	−0.02	−0.02
24.	Number of updates	5.31	6.39	0.53**	0.62**	0.06*	0.04	0.04	0.08**	−0.03	−0.02	−0.03	−0.04†

	Variable	11	12	13	14	15	16	17	18	19	20	21	22	23
12.	Last-second displayed joy	0.15**												
13.	First-second displayed joy	−0.16**	0.23**											
14.	Average displayed joy	0.01	0.45**	0.42**										
15.	Average displayed negative emotions	0.04†	−0.25**	−0.23**	−0.42**									
16.	Video length	0.03	−0.03	−0.05*	−0.06*	0.05*								
17.	Video length with facials	0.02	0.03	−0.02	−0.08**	−0.05*	0.69**							
18.	Funding goal (log)	0.00	−0.02	−0.01	0.00	−0.01	0.08**	−0.04						
19.	Funding duration	−0.02	0.02	−0.01	−0.01	0.01	0.03	0.01	0.16**					
20.	Popular location	0.00	0.02	0.00	0.04	0.00	0.02	0.02	0.06*	0.03				
21.	Reward levels	−0.01	0.02	0.06*	0.04†	0.01	0.01	−0.07**	0.19**	−0.07**	0.07**			
22.	Prior projects funded	−0.03	−0.02	−0.02	−0.04†	0.02	−0.02	−0.03	−0.09**	−0.02	−0.01	0.15**		
23.	Prior backing experiences	−0.04	0.01	0.03	0.01	0.01	−0.02	0.00	−0.02	−0.01	0.03	0.06*	0.32**	
24.	Number of updates	−0.01	0.03	0.00	0.02	0.01	−0.01	−0.06*	0.11**	−0.07*	0.08**	0.34**	0.24**	0.17**

** $p < 0.01$; * $p < 0.05$; † $p < 0.1$. Number of observations = 1,460.

sadness, and disgust), and took the average to control for negative emotions (*average displayed negative emotions)*. Lastly, we controlled for *video length* (the total number of seconds in a pitch video) and *video length with facials* (the total number of seconds in which an entrepreneur's face appeared in a video).

We also controlled for project-related variables that may influence funding performance. An entrepreneurial project's *funding goal* is the amount of money the project seeks. Projects with higher funding goals may be riskier and deter risk-averse people from backing the project (Chan & Parhankangas, 2017; Li et al., 2017; Mollick, 2014). Due to the high

skewness of *funding goal*, we took the natural log of this variable for analyses. *Project duration* (the number of days during which a project accepts funding) was also controlled for because longer duration allowed a project to be exposed to more potential backers (Chan & Parhankangas, 2017; Mollick, 2014). Projects in locations that are more entrepreneurial and have more crowdfunding projects may attract more backers (Li et al., 2017). We thus included a control variable (*popular locations*) that takes a value of 1 if the project is in one of the three most popular locations in our sample (Los Angeles, CA; New York, NY; and Brooklyn, NY) and 0 if otherwise. The number of a project's reward levels was controlled for because projects with a greater number of *reward levels* provided backers with more funding flexibility and options, thus making the project more attractive. We also controlled for project categories in our sample, such as product design, technology, and games.

Finally, we controlled for three variables that reflect entrepreneurs' experiences and qualities. Two variables reflect entrepreneurs' prior experiences with crowdfunding that may be contributing to funding success (Davis, Hmieleski, Webb, & Coombs, 2017): the number of successfully funded projects that an entrepreneur had prior to the launch of the focal project (*prior projects funded*) and the number of crowdfunding projects that an entrepreneur had backed in the past (*prior backing experiences*). The third variable is the *number of updates* that entrepreneurs posted on their crowdfunding website concerning their project progress (Chan & Parhankangas, 2017; Li et al., 2017; Mollick, 2014). Projects with frequent updates may be more appealing to backers because frequent updates signal that the entrepreneur is actively working on the project, responsive, and ready to report progress (Mollick, 2014).

RESULTS

Our STATA regression analyses results are shown in Models 1–14 of Table 2. Models 1–7 use *funding amount* as the dependent variable, whereas Models 8–14 use *the number of backers* as the dependent variable. Because results from both dependent variables are similar and funding amount is practically more interesting than the number of backers, below we discuss our results mainly using funding amount.

Among the control variables for projects or entrepreneur qualities (Model 1), we found that funding goals, reward levels for backers to choose from, project updates, and cities that have more crowdfunding projects were positively associated with funding amount. Among the control variables regarding the pitch, the length of the pitch (measured by *video length* and *video length with facials*) was negatively related to funding amount. Average displayed joy during the pitch had no statistically significant effect on funding amount. This is not surprising, given that average joy was a combination of joy across all moments in a pitch, and that joy in some moments (e.g., peaks) may be more effective than joy in other moments. Finally, we found that none of the other gestalt characteristics we controlled for—the trajectory of displayed joy, the displayed joy at the first and last second of the pitch—were significantly related to funding amount.

Models 2 and 3 provided an in-depth examination of the effects of peak displayed joy on funding amount. In Model 2, we found that the level of *peak displayed joy* was significantly related to funding amount ($\beta = 0.152$, $p < 0.01$), thereby supporting Hypothesis 1. This result, along with the results of control variables from Model 1, indicates that peak displayed joy is a key gestalt characteristic of displayed joy for predicting funding outcomes. A one-unit increase in the level of peak displayed joy boosts the raised funding amount in dollars by 16.42%, all else being constant.

Hypothesis 2 concerns the effect of the total length of time for peak displayed joy on funding performance. We thus added the variable *peak duration* and its squared term in Model 3. We found that the first-order effect of this variable is positive and statistically significant ($\beta = 0.539$, $p < 0.05$), and its squared term is negative and statistically significant ($\beta = -0.107$, $p < 0.01$). We graphed the relationship between *peak duration* and *funding amount*, holding all other variables at means (Figure 1). The figure shows an inverted *U*-shaped relationship, with *funding amount* being highest when the total length of peak displayed joy time is 2.51 seconds. Hence, Hypothesis 2 was supported.

Models 4 and 5 further examined the intensity and duration effects of peak displayed joy in different temporal phases, and we focused especially on the beginning and ending phases. To test Hypotheses 3a and 3b, we entered each phase's peak displayed joy (Model 4). Because at least one of these peak displayed joy variables equals the entire video's peak displayed joy, we excluded the entire video's peak displayed joy from this model. Both the *beginning phase's peak displayed joy* ($\beta = 0.094$, $p < 0.01$) and *ending phase's peak displayed joy* ($\beta = 0.056$, $p < 0.05$) were significantly related to funding

TABLE 2
OLS Regression Results

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Dependent variable: funding amount (log)						
Funding goal (log)	0.278**	0.268**	0.267**	0.262**	0.273**	0.263**	0.269**
	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)	(0.058)
Funding duration	−0.034**	−0.035**	−0.034**	−0.034**	−0.035**	−0.034**	−0.035**
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Popular location	0.540**	0.527**	0.529**	0.506**	0.514**	0.507**	0.513**
	(0.161)	(0.162)	(0.162)	(0.161)	(0.163)	(0.162)	(0.162)
Reward levels	0.099**	0.097**	0.097**	0.097**	0.098**	0.097**	0.097**
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
Prior projects funded	0.031	0.036	0.037	0.043	0.036	0.042	0.037
	(0.030)	(0.030)	(0.030)	(0.029)	(0.030)	(0.029)	(0.030)
Prior backing experiences	0.002	0.002	0.002	0.001	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Number of updates	0.197**	0.195**	0.195**	0.193**	0.194**	0.194**	0.193**
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
Displayed joy trajectory	1.896	2.043	2.028	2.394†	1.994	2.037	2.062
	(1.385)	(1.375)	(1.380)	(1.363)	(1.358)	(1.337)	(1.353)
Last-second displayed joy	0.012	−0.012	−0.011	−0.018	−0.011	−0.018	−0.011
	(0.024)	(0.024)	(0.024)	(0.026)	(0.024)	(0.026)	(0.024)
First-second displayed joy	0.054*	0.038	0.036	0.019	0.035	0.019	0.035
	(0.024)	(0.025)	(0.025)	(0.026)	(0.025)	(0.026)	(0.025)
Average displayed joy	−0.013	−0.111†	−0.122*	−0.156*	−0.125*	−0.143*	−0.126*
	(0.058)	(0.060)	(0.062)	(0.062)	(0.063)	(0.063)	(0.063)
Average displayed negative emotions	−0.193	−0.176	−0.165	−0.163	−0.203	−0.150	−0.167
	(0.215)	(0.214)	(0.214)	(0.216)	(0.218)	(0.217)	(0.217)
Video length	−0.001†	−0.002*	−0.002*	−0.002*	−0.002*	−0.002*	−0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Video length with facials	−0.003*	−0.003*	−0.003*	−0.003**	−0.003*	−0.003**	−0.003**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Peak intensity (H1)		0.152**	0.149**		0.148**		0.147**
		(0.034)	(0.035)		(0.034)		(0.034)
Peak duration (H2)			0.539*	0.597*		0.570*	
			(0.269)	(0.270)		(0.273)	
Peak duration squared (H2)			−0.107**	−0.115**		−0.112**	
			(0.039)	(0.039)		(0.040)	
Beginning phase's peak intensity (H3a)				0.094**		0.072**	
				(0.025)		(0.025)	
Ending phase's peak intensity (H3b)				0.056*		0.051*	
				(0.026)		(0.024)	
Middle phase's peak intensity				0.023		0.039†	
				(0.022)		(0.024)	

TABLE 2
(Continued)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Dependent variable: funding amount (log)						
Beginning phase's peak duration (H4a)					0.456		1.128**
					(0.338)		(0.352)
Beginning phase's peak duration squared (H4a)					−0.076**		−0.371**
					(0.025)		(0.072)
Ending phase's peak duration (H4b)					0.092		0.212
					(0.175)		(0.285)
Ending phase's peak duration squared (H4b)					−0.004		−0.043
					(0.012)		(0.046)
Middle phase's peak duration					−0.144		−0.113
					(0.212)		(0.176)
Middle phase's peak duration squared					0.013		0.006
					(0.013)		(0.007)
Constant	3.646**	3.024**	4.501**	4.802**	4.559**	4.836**	4.510**
	(0.963)	(0.967)	(0.629)	(0.612)	(0.632)	(0.615)	(0.628)
Project categories controlled for	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)
R-squared	0.43	0.44	0.44	0.44	0.44	0.44	0.44
	Model 8	**Model 9**	**Model 10**	**Model 11**	**Model 12**	**Model 13**	**Model 14**
	Dependent variable: number of backers (log)						
Funding goal (log)	0.152**	0.146**	0.145**	0.142**	0.148**	0.143**	0.146**
	(0.032)	(0.032)	(0.031)	(0.031)	(0.032)	(0.032)	(0.032)
Funding duration	−0.021**	−0.021**	−0.020**	−0.020**	−0.021**	−0.020**	−0.020**
	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)
Popular location	0.339**	0.332**	0.332**	0.318**	0.326**	0.318**	0.326**
	(0.099)	(0.100)	(0.100)	(0.099)	(0.100)	(0.099)	(0.100)
Reward levels	0.058**	0.057**	0.057**	0.057**	0.058**	0.057**	0.057**
	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Prior projects funded	0.025	0.028	0.029	0.032	0.028	0.032	0.028
	(0.020)	(0.020)	(0.020)	(0.019)	(0.020)	(0.019)	(0.019)
Prior backing experiences	0.002*	0.002†	0.002†	0.002†	0.002†	0.002†	0.002†
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Number of updates	0.151**	0.150**	0.150**	0.149**	0.149**	0.149**	0.149**
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Displayed joy trajectory	2.046*	2.127**	2.119**	2.339**	2.100**	2.129**	2.124**
	(0.825)	(0.809)	(0.806)	(0.802)	(0.806)	(0.782)	(0.795)
Last-second displayed joy	0.002	−0.011	−0.011	−0.017	−0.011	−0.016	−0.011
	(0.015)	(0.015)	(0.015)	(0.016)	(0.015)	(0.016)	(0.015)
First-second displayed joy	0.032*	0.023	0.021	0.011	0.022	0.010	0.022
	(0.015)	(0.015)	(0.015)	(0.016)	(0.015)	(0.016)	(0.015)
Average displayed joy	0.028	−0.026	−0.032	−0.054	−0.032	−0.047	−0.032
	(0.035)	(0.036)	(0.037)	(0.037)	(0.037)	(0.037)	(0.037)

TABLE 2
(Continued)

	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14
	Dependent variable: number of backers (log)						
Average displayed negative emotions	−0.187	−0.177	−0.169	−0.166	−0.185	−0.158	−0.169
	(0.127)	(0.127)	(0.127)	(0.128)	(0.129)	(0.128)	(0.129)
Video length	−0.000	−0.001†	−0.001	−0.001	−0.001	−0.001	−0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Video length with facials	−0.002**	−0.002**	−0.002**	−0.002**	−0.002**	−0.002**	−0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Peak intensity (H1)		0.084**	0.081**		0.082**		0.082**
		(0.019)	(0.019)		(0.019)		(0.019)
Peak duration (H2)			0.386**	0.420**		0.404**	
			(0.148)	(0.149)		(0.150)	
Peak duration squared (H2)			−0.081**	−0.086**		−0.084**	
			(0.023)	(0.023)		(0.024)	
Beginning phase's peak intensity (H3a)				0.055**		0.044**	
				(0.015)		(0.015)	
Ending phase's peak intensity (H3b)				0.035*		0.032*	
				(0.015)		(0.014)	
Middle phase's peak intensity				0.009		0.019	
				(0.013)		(0.014)	
Beginning phase's peak duration (H4a)					0.232		0.486*
					(0.179)		(0.201)
Beginning phase's peak duration squared (H4a)					−0.034*		−0.153**
					(0.014)		(0.043)
Ending phase's peak duration (H4b)					0.020		0.154
					(0.098)		(0.183)
Ending phase's peak duration squared (H4b)					−0.000		−0.027
					(0.007)		(0.028)
Middle phase's peak duration					−0.091		−0.098
					(0.128)		(0.094)
Middle phase's peak duration squared					0.007		0.004
					(0.008)		(0.004)
Constant	1.285**	0.942†	1.674**	1.822**	1.720**	1.844**	1.701**
	(0.485)	(0.489)	(0.366)	(0.354)	(0.368)	(0.356)	(0.366)
Project categories controlled for	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)	(Yes)
R-squared	0.52	0.52	0.53	0.53	0.53	0.53	0.53

** $p < 0.01$; * $p < 0.05$; † $p < 0.1$.
Number of observations = 1,460. Robust standard errors in parentheses.

amount, supporting Hypotheses 3a and 3b. Based on the coefficients, a one-unit increase in *peak displayed joy* in the beginning and ending phases, respectively, boosts the raised funding amount in dollars by 9.86% and 5.76%, all else being equal. The peak displayed joy in the middle phase did not have a significant effect on funding amount.

To test Hypotheses 4a and 4b, we replaced the variable *peak duration* with each phase's respective peak duration (Model 5). We found support for Hypothesis 4a: the squared term of the *beginning phase's peak duration* has a significantly negative effect on *funding amount* ($\beta = 0.076$, $p < 0.01$). As shown in Figure 2, *funding amount* decreases after the *beginning phase's peak duration* exceeds a certain point, with *funding amount* being highest when the *beginning phase's peak duration* is approximately three seconds. However, we did not find support for Hypothesis 4b. Neither the ending nor middle phases' peak duration has a significant nonlinear effect on funding amount.

In a robustness check, we tested Hypotheses 3a, 3b, 4a, and 4b by measuring peak displayed joy in the first quarter (beginning) and last quarter (ending) of a video. The results (shown in Models 6 and 7 of Table 2) continue to support Hypotheses 3a, 3b, and 4a, but not 4b. The main results from using the *number of backers* as the dependent variable (see Models 8–14) are similar to Models 1–7 using *funding amount* as the dependent variable. Overall, across our analyses, we found consistent support for the positive effect of peak displayed joy on funding performance, especially in the beginning and ending phases of a funding pitch. We also found support for the inverted *U*-shaped effect of peak duration in the entire pitch and in the beginning phase of a pitch.

DISCUSSION

Our model assesses the extent to which an entrepreneur's peak displayed joy during a funding pitch can help to attract funding support. By analyzing over eight million frames from 1,460 project pitch videos, we gained several meaningful insights. Controlling for average, beginning, ending, and trajectory of displayed joy, we found a unique influence of peak displayed joy on funding performance, especially in the beginning and ending phases of a pitch. Interestingly, we also found that the total temporal length of peak displayed joy had an inverted *U*-shaped relationship with funding performance: funding performance increases with the temporal length of peak up to a certain point, but extended time at the peak level of joy can negatively influence funding performance. Overall, our findings advance the literature in several valuable ways, suggest fruitful avenues of future research, and generate interesting practical implications.

Theoretical Implications

Temporal dynamics of emotional display in the interpersonal context. A main contribution of this

FIGURE 1
The Relationship between Peak Displayed Joy Duration and Funding Amount (Logarithm Transformed)

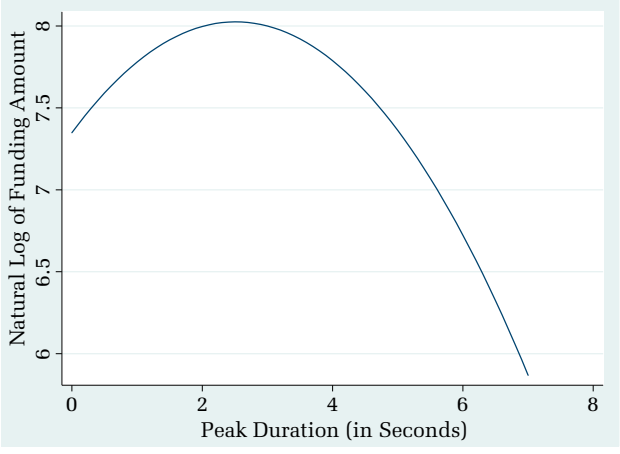
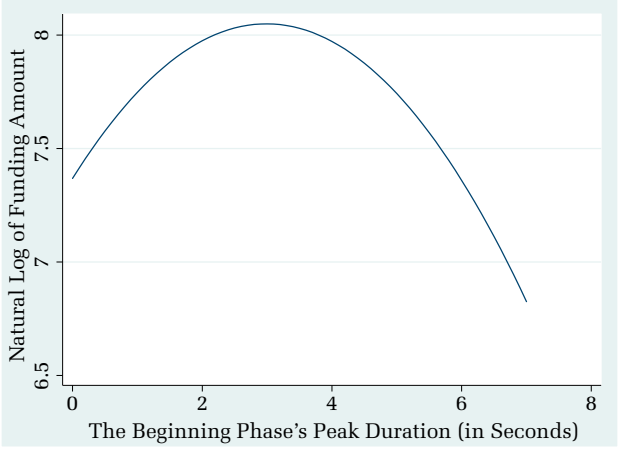


FIGURE 2
The Relationship between the Beginning Phase's Peak Displayed Joy Duration and Funding Amount (Logarithm Transformed)



study is that it brings together two disparate but related research streams that focus either on the temporal dynamics of emotions or the interpersonal effects of emotional displays. Prior research on emotions' temporal dynamics has mostly taken an *intrapersonal* perspective, looking at how changes to one's felt emotions may influence the person's own summary of experiences (e.g., Do et al., 2008; Fredrickson, 2000) or psychological well-being (Houben et al., 2015; Kuppens & Verduyn, 2017). In contrast, past research on *interpersonal* influence of emotions has often ignored the temporal dynamics of the emotions. We brought together these two streams of literature by examining how the *temporal* dynamics of emotional displays influence observers in an *interpersonal* context. This is an important contribution to the emotion literature because emotions are both social and changing in nature (Hareli & Rafaeli, 2008; Kuppens & Verduyn, 2017; van Kleef, 2016). An examination of both aspects (interpersonal and temporal) enables us to more deeply understand the subtle and adaptive functions of emotions in social interactions. In fact, scholars have begun to recognize the value of studying the critical influence of one's changing emotions on interpersonal interactions and relationships (Butler, 2015; Fischer & Manstead, 2008; Hareli & Rafaeli, 2008). Our study is among the very few that have made headway toward this direction (see Liu & Maitlis [2014] for another study that examined the changing emotions in an interpersonal setting). We make a novel contribution by fleshing out the roles of specific temporal dimensions (peak strength, duration, and phase) in an important interpersonal context (entrepreneurs persuading others to provide funding for new ventures).

More specifically, our study contributes to the emotion temporal dynamics research in several ways. First, we highlight that emotion temporal dynamics can have important interpersonal and organizational consequences. As mentioned, prior studies on emotion temporal dynamics have mostly focused on intrapersonal outcomes of emotions, such as one's own well-being and experience summaries (Fredrickson & Kahneman, 1993; Houben et al., 2015). These studies are meaningful for understanding the implications of the ups and downs of emotional experiences for oneself. Although these intrapersonal outcomes are critical in people's daily lives, they are less directly influential in management and organization settings. In this research, we project the impact of entrepreneurs' emotion temporal dynamics (e.g., peak intensity and duration) onto the funding decisions of other people. Such interpersonal outcomes of one's emotional displays are more downstream and can more directly impact organizations (e.g., new ventures' funding performance).

Our study also suggests that by extending emotion temporal dynamics from intrapersonal to interpersonal contexts, scholars can discover new insights. For instance, research in intrapersonal settings has suggested that both peak and ending moments of one's emotional experience can significantly influence one's own evaluation of the experience (Ariely & Carmon, 2000; Fredrickson & Kahneman, 1993). However, our paper suggests a more nuanced and unexpected pattern in an *interpersonal* context—one's peak emotion moments compared to the ending emotion moment play a much more salient role in affecting observers' decisions. A possible explanation is that one's ending emotion moment (e.g., how an entrepreneur feels at the end of a pitch), although personally important for the individual (Fredrickson, 2000), is less meaningful to viewers who observe that emotion. Additionally, prior research on emotion temporal dynamics has focused mostly on the strength level of emotions. In line with event system theory (Liu et al., 2018; Morgeson et al., 2015), our research demonstrates that, at least in the interpersonal context, temporal duration and phases of an emotional event also matter. Overall, our study provides novel and useful insights to the management literature by investigating emotional temporal dynamics in interpersonal contexts.

Moreover, we contribute to research on the interpersonal influence of emotions by examining the neglected but important *temporal* aspects of emotions. The management literature on interpersonal influence of emotions has mostly approached displayed emotions as a static construct—i.e., examining one's displayed emotions in general or at a specific point of time. However, recent studies (e.g., Hareli & Rafaeli, 2008; Liu & Maitlis, 2014) have highlighted the importance of considering *temporal* dynamics of emotional displays in an interpersonal context. Liu and Maitlis's (2014) qualitative study, for instance, suggested that managers' varied emotional displays over time influenced the interpersonal dynamics among managers during top management meetings. Our study goes beyond this prior literature by highlighting the roles of specific temporal dimensions (peak, duration, and phase) of displayed emotions. Peaks are impactful, because they can be extremely salient and memorable to

people and can exert a unique impact on people's memory above and beyond the average or general state of the stimuli over time. Duration and phases of peak moments are also important because individuals can have distinct reactions to the events with different temporal lengths and at different temporal phases (Morgeson et al., 2015). Our findings reveal that unpacking these temporal aspects can help us more fully understand the interpersonal influence of emotions. Moreover, we quantify these specific dimensions of temporal dynamics using a reliable and replicable approach based on artificial intelligence and facial expression analysis techniques. Through theorizing and quantifying these specific temporal dimensions, our study provides substantial guidelines for future research to investigate temporal dynamics of emotions in interpersonal contexts.

Too much (or long) of a good thing. This research sheds novel light on the potential negative influence of positive emotional displays in the domain of entrepreneurship and management. Prior research has tended to center on the positive impact of entrepreneurs' displayed positive emotions on their acquisition of financial resources (e.g., Baron, 2008; Chen et al., 2009; Li et al., 2017; Murnieks et al., 2016). For instance, Li et al. (2017) found that more enthusiastic entrepreneurs can raise more money through crowdfunding. Our research shows that although a higher level of peak displayed joy can lead to a better fundraising outcome, when entrepreneurs spend too much time during a pitch at the peak joy level, funding performance can suffer. This finding of a "dark side" of positive emotions is in line with emotion research in other domains (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001; Cyders & Smith, 2008; Gruber, Mauss, & Tamir, 2011), as well as the discovery of "too much of a good thing" in psychology and management research (Grant & Schwartz, 2011; Pierce & Aguinis, 2011). Scholars (Grant & Schwartz, 2011; Pierce & Aguinis, 2011) have reviewed evidence regarding the effects of a wide range of desirable psychological and organizational attributes (e.g., knowledge, courage, humanity, justice, and slack resources) on individual or organizational outcomes and found a common pattern: at high levels, positive effects begin to turn negative (i.e., too much of a good thing), such that optimal outcomes are achieved when the desirable attributes are at a moderate level.

Our study, however, makes a unique contribution to this stream of literature by explicitly distinguishing *duration* (the total length of peak displayed joy moments) from *strength* (the level of peak displayed joy). Prior studies that have unveiled the nonlinear effect of positive experiences have directed their attention toward the strength level of the experiences—such as the level of life satisfaction (Oishi, Diener, & Lucas, 2016), the level of citizenship behaviors (Bolino & Turnley, 2005), and the level of slack resources (Tan & Peng, 2003)—and showed that a moderate level is more effective. We demonstrated a linear positive impact of the level of peak displayed joy (Hypothesis 1), but, interestingly, a nonlinear impact of the total length of peak displayed joy moments (Hypothesis 2). Accordingly, it could be the *duration*, rather than the *strength level*, of an event that accounts for the "too much of a good thing" phenomenon. This finding helps to open up exciting opportunities for future research to further differentiate which aspects, strength or duration, of positive experiences account for "too much of a good thing." For example, prior research has found that life satisfaction exerts an inverted *U*-shaped effect on education and income, such that an extremely high level of life satisfaction leads people to engage in less education and earn less income (Oishi et al., 2016). Our finding can inspire the question of whether it is the strength or the duration of life satisfaction that contributes to the inverted *U*-shaped relationship uncovered by previous research. For instance, extremely high life satisfaction for a short period may not change a person's engagement in education, but a lengthy period of even just moderate life satisfaction may actually disengage people from education. Only by distinguishing duration from the strength dimension of life satisfaction can scholars understand its influence more clearly and thoroughly. Hence, our theorizing and findings suggest that if temporal factors (e.g., duration) are incorporated into research that has mainly focused on strength, new research insights may emerge.

Novel emotion measurement. This study stands out from previous emotion studies by adopting a novel method of measuring displayed emotion, which combines the facial expression analysis with artificial intelligence and big data. This unique facial expression analysis technology enables us to extend the field of human emotions in the following meaningful ways. First, facial expression analysis technology allows emotion researchers to more objectively measure the common displayed emotions. Existing research has relied heavily on survey participants' or human coders' subjective interpretation of emotional expressions, and thus may not be as valid and reliable as expected (van Kleef,

De Dreu, & Manstead, 2004). Facial expression analysis technology can significantly increase the accuracy and objectivity of measuring displayed emotions and generate more nuanced and robust implications from research.

Second, the facial expression analysis technology enables researchers to track emotional expressions over time and thus advances research on temporal dynamics of displayed emotions. Prior research on emotion temporal dynamics has relied heavily on either repeated survey measures or neuroscience and psychophysiological measures. Both methods face significant challenges. The repeated survey measures can be very distracting to survey participants (Cornelius, 1996), especially when such measures need to be administered repeatedly to capture changing emotions (Gruber, Kogan, Quoidbach, & Mauss, 2013). The neuroscience and psychophysiological tools are more suitable to assess felt emotions than to capture displayed emotions in videos, because these tools need to be physically attached to a person's body to detect the person's emotions. Recently, an emerging stream of research has adopted the video-based micro-ethnography approach to manually analyze the moment-to-moment recorded scenes (e.g., gestures and speech) in contexts such as classrooms, social interactions, and companies (Lebaron, Jarzabkowski, Pratt, & Fetzer, 2016; Toraldo, Islam, & Mangia, 2016). Some studies have even adopted this method for studying emotions (Christianson, 2016; Jarrett & Liu, 2016; Liu & Maitlis, 2014). While the micro-ethnography approach has made a significant leap for studying temporal dynamics of displayed emotions, the method still relies on human coders' subjective judgment and manual coding. In contrast, using the automated facial expression analysis technology in this study, researchers can more efficiently and objectively capture changing displayed emotions frame by frame. The tremendous amount of dynamic emotional information captured through this method provides opportunities to discover more nuanced and refined patterns compared to traditional methods. As such, future research on emotion dynamics may benefit substantially from applying this new method.

Third, this new visual method can greatly advance research in a number of areas. According to a recent survey of various methodologies used in premier organizational research journals (Wang & Reger, 2017), the visual methodology is particularly promising. There have also been recent calls for more research using visual data, especially videos (Christianson, 2018; Congdon, Novack, & Goldin-Meadow, 2016). Video data "[provide] fine-grained timing information, which makes it possible for researchers to measure the frequency, duration, and timing of behaviors" that are important for management or organizations (Christianson, 2018: 262). Video data also allow researchers to quantify and understand human beings' transient movements (e.g., a momentary gesture) that can be easily missed by other data collection methods (Congdon et al., 2016). Despite this need, research using video data is still in its infancy (0.6% of total articles in top tier journals for management and organizational research between 1990 and 2015 [Christianson, 2018]). The lack of research using video data may be because such research has traditionally relied on manual approaches to analyzing videos (e.g., Liu & Maitlis, 2014). Our research provides clear guidelines on how to implement a user-friendly visual methodology to automate the collection and analysis of visual materials in order to obtain more nuanced and accurate data for management research.

Limitations and Future Research Directions

First, when examining the temporal characteristics of displayed joy, we focused on peak states and controlled for other temporal characteristics according to gestalt characteristics theory (e.g., ending states, trend, and average). Future research can draw on other theoretical perspectives to probe into additional temporal characteristics (e.g., emotion covariation and inertia [see Kuppens & Verduyn, 2017]). These other temporal aspects might also be relevant for studying emotional displays in interpersonal communication. In addition, although not the focus of the current paper, the ordering of the critical moments of positive and negative emotions might have nontrivial implications (Teixeira et al., 2012). We did not find any specific theory that can apply in our context of study to suggest how the ordering of positive and negative emotions might matter, but this lack of theory actually indicates a potentially fruitful research opportunity. Studies of these other types of temporal dynamics can also benefit from utilizing a more objective, efficient, and scalable tool for quantifying moment-to-moment emotions, as we did in this paper.

Second, we probed into the display of the most fundamental positive emotion, joy, while controlling for the average of the basic negative emotions (e.g., anger, disgust, and sadness). Yet, we did not examine their temporal characteristics because negative

emotions are far less prominent in our research context than are positive emotions, such as joy. That said, examining negative emotions can be a promising opportunity for future research, especially in contexts where negative emotions are more likely to occur (e.g., board meetings, political campaigns). Moreover, we believe that examining the temporal nature of both positive and negative discrete emotions (and even their interactions) in interpersonal settings is valuable. Such research can benefit tremendously from the new measurement method that we adopted in this study.

Third, although joy is the most fundamental and universal positive emotion, there are other, subtler, positive emotions that we could not examine in this research setting, such as gratitude, passion, and contentment (Chen, Liu, & He, 2015; Fredrickson, 2010; Shaver, Schwartz, Kirson, & O'Connor, 1987). These other positive emotions encompass subtle elements (e.g., a sense of self-identity as an element for passion [Cardon et al., 2009]) that are often not expressed through facial motions. Successful measurement of the expression of these more nuanced positive emotions would rely on a more in-depth investigation of which emotions are likely to occur in a given context (Ekman, 1993). One promising direction for future research is to conduct a comprehensive analysis of both the visual and verbal content of a video in order to measure the expressions of other, more nuanced, positive emotions (e.g., Liu & Maitlis, 2014). One may also adopt a participatory approach by walking through videos together with a selective sample of entrepreneurs and funders to attain helpful insights (Jarrett & Liu, 2016).

Lastly, our research setting (i.e., entrepreneurs presenting their project ideas to the public on the Internet to solicit funding) did not enable us to collect granular data from each individual backer on how much support they each provided and what motivated their decisions. Thus, we were unable to investigate the underlying affective (e.g., emotional contagion) or cognitive (e.g., perceived potential to succeed) mechanisms that may translate an entrepreneur's peak displayed joy into each viewer's decision, or to consider the funding performance over time. Gauging these factors is perhaps more feasible in traditional pitching contexts, where each potential investor can be readily observed and interviewed. Future research could collect data from such traditional contexts, and from both entrepreneurs and backers, and then employ multiple analytical methods (e.g., content and facial expression techniques) to test the effects of these interesting factors and mechanisms. Moreover, when the presenter and audience are in the same room, it would also be valuable to probe into the influence of the reverse emotional spread from the audience to the presenter, and the collective emotions among the audience (Hareli & Rafaeli, 2008).

Practical Implications

Given that crowdfunding is a rapidly growing and increasingly critical funding source, the findings of this research produce a number of valuable practical insights. Although past research has advised entrepreneurs that providing pitch videos is important for attracting crowdfunding (Mollick, 2014), advice about when and how an entrepreneur should let his or her emotional displays unfold in the pitch has been rare. This research reveals that when pitching a project to attract financial support, an entrepreneur's peak displayed joy plays a critical role. The higher their level of peak displayed joy, the better the pitch outcome. This study also unpacks the distinct relationships that strength and duration of peak displayed joy have with funding performance. Our findings highlight the importance for entrepreneurs to manage the total *duration* of their peak joy moments. Although a greater level of peak displayed joy is associated with a better pitch outcome, more *time* at the peak displayed joy level can negatively impact the pitch outcome because prolonged peaks may prompt audiences to draw negative inferences (e.g., that the entrepreneurs are overly optimistic). Thus, entrepreneurs should display higher peak joy, but avoid displaying prolonged peak joy, in their funding pitch.

Moreover, we suggest that entrepreneurs should pay special attention to the beginning and ending phases of their pitches. This research provides evidence for the insights from communication research that have emphasized primacy and recency effects in communications (Chong & Druckman, 2010; Murphy, Hofacker, & Mizerski, 2006). Our findings suggest that the beginning and ending phases of a pitch are crucial for entrepreneurs to leave a good impression on the audience. In particular, our findings suggest that during the beginning and ending phases, entrepreneurs should strive to reach a higher peak displayed joy level in order to more effectively attract the audience. Yet, as revealed in this research, entrepreneurs should be advised not to display peak joy for too long, even during the beginning phase of a funding pitch.

CONCLUSION

This study is among the first to consider both the strength level and temporal characteristics of the most fundamental positive emotion, joy, displayed in an entrepreneur's pitch. Based on data from over eight million frames in 1,460 pitch videos, our findings reveal the significant influence of an entrepreneur's peak displayed joy level, especially during the beginning and ending phases of a funding pitch, on funding performance. Interestingly, although a higher level of peak displayed joy leads to better funding performance, prolonged display of peak joy can undermine funding performance. These findings not only provide interesting implications for entrepreneurs, but also highlight a novel interpersonal approach to studying the dynamic influence of emotional displays, as well as the value of applying automated facial expression analysis techniques to investigate sophisticated management and organizational issues.

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