Can You Hear Me Now? Engendering Passion and Preparedness Perceptions with Vocal Expressions in Crowdfunding Pitches

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Abstract

The voice is often the only continuous channel of expression in pitch videos. We isolate the influence of entrepreneurs' vocal expressions on funding by examining how valence (positivity/negativity) and arousal (activation) shape funders' perceptions of passion and preparedness. We show that an entrepreneur's high-arousal vocal expressions, whether positive or negative, increase perceptions of their passion. Entrepreneurs are perceived as more prepared when the valence and arousal of their vocal expressions are congruent. We test our hypotheses in the context of rewards-based crowdfunding, using both an experiment and a speech affect analysis of real-world crowdfunding pitches.

1. Introduction

Entrepreneurs' expressions[1] in a funding pitch shape funder perceptions and behavior, manifesting through a variety of channels, including bodily gestures, facial expressions, and variation in vocal tone. These expressions have typically been studied as a homogenous whole (Cardon et al., 2017; Chen et al., 2009; Davis et al., 2017; Li et al., 2017; Mitteness et al., 2012). In contrast, recent studies have focused on the distinct influence of specific channels of expression, including affect-laden words (Allison et al., 2017; Balachandra et al., 2019; Parhankangas and Ehrlich, 2014; Ren et al., 2021), gestures (Clarke et al., 2019), and facial expressions (Davis et al., 2021; Jiang et al., 2019; Stroe et al., 2020; Warnick et al., 2021).

Vocal expressions are conspicuously absent from these focused efforts to understand each expression channel's influence in funding pitches. This absence merits attention given that scholars in other literatures have noted the particular persuasive power of the voice, which conveys a speaker's affect via "qualities of speech apart from the actual verbal content" (Juslin and Scherer, 2005, p. 66). Vocal expressions, like all affective expressions, can be defined by two fundamental dimensions: valence (degree of positivity or negativity) and arousal (degree of activation) (Clore and Schnall, 2005; Russell, 2003). These two dimensions are the conceptual basis for all affective states and expressions, including moods and discrete emotions (Russell et al., 2003), in terms of both their expression and their perception by others.

The vocal expression literature has sought to profile valence and arousal, as well as certain discrete emotions, using vocal characteristics (e.g., frequency; Banse and Scherer, 1996; Juslin and Scherer, 2005; Sauter et al., 2010). Consistent with the idea that the voice can persuade, some vocal expressions of discrete emotions have been linked to listener perceptions (e.g., Wang et al., 2021; Zampetakis et al., 2017). Yet, the logical next step—studying how the valence and arousal of vocal expressions can influence perceptions and decisions—has not been

[1] Expressions convey affect, an umbrella term that includes moods, feelings, and emotions, which refer to affective experiences tied to a specific object or situation (Barrett et al., 2007).

taken.[2] This gap in understanding is surprising, as real-life expressions manifest as an array of valence and arousal combinations, many of which fail to align well with specific discrete emotions (Russell et al., 2003).

The importance of understanding the impact of the valence and arousal of entrepreneurs' vocal expressions is heightened by the growing importance of pitch videos. Pitch videos initially gained popularity in online contexts, such as crowdfunding, and are beginning to supplement pitch decks as a way to pique the interest of angel investors, venture capitalists, and venture accelerators (Pitchtape, 2020). These videos typically feature continuous voiceovers that accompany a variety of images and other multimedia material, whereas the entrepreneur's facial expressions or bodily gestures are often shown only briefly, if at all. In this way, pitch videos are generally "held together with a voiceover" such that the voice serves as the only continuous source of expression (Indiegogo, 2017). Thus, the voice may well be the most salient form of expression in most pitch videos.

Our work sheds light on how the valence and arousal of an entrepreneur's vocal expressions influence potential funders. Given that entrepreneurship is a distinct domain and pitching to obtain resources is a key entrepreneurial activity (Venkataraman, 2019), we tailor our theorizing around two constructs widely highlighted in research on funder decision-making: perceived passion and perceived preparedness (Cardon et al., 2017; Chen et al., 2009; Li et al., 2017; Murnieks et al., 2016; Pollack et al., 2012; Shane et al., 2020; Warnick et al., 2018). We predict that these two perceptions are shaped by the valence and arousal of the entrepreneur's vocal expressions. Our prediction builds upon prior work which holds that entrepreneurs who speak with "varied tone and pitch" are perceived as more passionate (Chen et al., 2009, p. 204). We supplant this intuitive notion with research aligned with the two-dimensional model of affect, including theory of entrepreneurial passion (e.g., Cardon et al., 2009) and valence-arousal

[2] What scholars *have* focused on are vocal characteristics and subjective proprieties derived from vocal characteristics (confidence, sincerity). These, in turn, have been argued to shape the persuasive influence of vocal expressions (e.g., Banse and Scherer, 1996; Burgoon et al., 1990; Juslin and Laukka, 2003; Klofstad, 2016; Lowe et al., 2017; Van Zant and Berger, 2020; Wang et al., 2021).

congruence theory (e.g., Robinson et al., 2004), which we use to predict how the valence and arousal of vocal expressions shape how the pitch is received by funders.

We test our hypotheses in two studies. In Study 1, we use an experiment to hold pitch content (words and visuals used) constant while manipulating the valence and arousal of the vocal expression of words via a trained professional actor. Here, we examine the joint influence of the valence and arousal of vocal expressions on perceived passion, perceived preparedness, and funding intentions. In Study 2, we use a speech affect algorithm on archival Kickstarter pitch data to examine the relationships of the valence and arousal of entrepreneurs' vocal expressions with perceived passion, perceived preparedness, and actual funding. In doing so, we extend the external validity of our experiment by analyzing the influence of a wide range of naturalistic vocal expressions in funding pitches.

Our theorizing and empirical findings offer three main contributions. First, we contribute to the literature on entrepreneurial pitches by focusing on the influence of vocal expressions. More specifically, we complement research that has isolated the influence of other channels of expression, including facial expressions (Stroe et al., 2020; Warnick et al., 2021), bodily gestures (Clarke et al., 2019), and linguistic content (Allison et al., 2017; Balachandra et al., 2019; Chen et al., 2016; Parhankangas and Ehrlich, 2014; Ren et al., 2021). We provide insight into the role that the voice plays alone, rather than as part of other measures (cf. Chen et al., 2009). Our study of the voice through the framework of the two-dimensional model (Russell, 2003) allows us to compare, contrast, and synthesize findings regarding how valence and arousal of different communication channels influence important entrepreneurial processes and outcomes, such as funding.

Second, we contribute to the literature on perceived passion and preparedness in entrepreneurial pitches by examining the sources of these perceptions. Prior work demonstrates that perceptions of passion and preparedness are influenced by entrepreneurs' nonverbal behavior (Clarke et al., 2019; Huang and Pearce, 2015), including body language, gestures, and facial expressions, together with changes in vocal intonation (e.g., Chen et al., 2009; Cardon et

al., 2017; Davis et al., 2017; Galbraith et al., 2014; Oo et al., 2019; Pollack et al., 2012). These approaches have masked the distinct influence of the voice on such perceptions. We show that the valence and arousal of vocal expressions are associated with perceptions of passion and of preparedness, thereby increasing funding. Specifically, we show that an entrepreneur's high-arousal vocal expressions, whether positive or negative, increase perceptions of their passion, and that entrepreneurs are perceived as more prepared when the valence and arousal of their vocal expressions are congruent. A benefit of our contribution is that we tie vocal expressions to entrepreneurship constructs of enduring interest, promoting theoretical parsimony and richness in understanding pitches.

Finally, we move beyond the entrepreneurship literature's emphasis on positive expressions (Baron et al., 2011, 2012) to explain how and why negative expressions can also yield perceptions of passion and preparedness, thereby promoting funding. We do this by examining a wide range of vocal expressions, ranging from negative to positive valence and low to high arousal. We thus begin to answer the call of entrepreneurship scholars to consider the arousal of expressions in addition to their valence (Foo et al., 2015; Huang et al., 2020), highlighting that the influence of both positive and negative vocal expressions depends on their arousal. This complements recent work by Warnick and colleagues (2021), who found that pitches feature facial expressions of emotions of negative and positive valence, as well as low and high arousal—including happiness, anger, fear, and sadness. Working in tandem, our studies extend entrepreneurship research by (1) isolating the impact of vocal expressions in pitches based on their valence and arousal, (2) investigating these dimensions of vocal expressions as antecedents of passion and preparedness perceptions, and (3) recognizing the role of both negative and positive expressions in pitches.

2. Literature review

2.1. The two-dimensional model of affect

Affective expressions are key to social interaction (Clore and Schnall, 2005; Scherer, 2003), shaping the way one is perceived by others. The two-dimensional model of affect

characterizes the experience and expression of affect on the basis of valence and arousal (Russell et al., 2003). Valence is the negativity or positivity of an expression, whereas arousal denotes its activation, energy, or intensity (Clore and Schnall, 2005; Ekman, 2007; Russell et al., 2003). Affective expressions are processed—immediately and often without conscious reflection—by receivers who are influenced by the expression (Ekman, 2007; Robinson et al., 2004). Receivers are able to consistently identify vocal expressions of differing valence and arousal (Russell et al., 2003) regardless of differences in background, culture, and age (Elfenbein and Ambady, 2002; Sauter and Scott, 2007).

2.2. Vocal expressions of affect

Affect is expressed in a variety of ways, including the human voice. While vocal expression[3] has yet to receive much attention in entrepreneurship research, its importance has long been noted by scholars in other areas (see Table 1 for an overview). For instance, to explain the ability of receivers to distinguish between expressions, a number of studies have examined vocal characteristics such as duration, shimmer, jitter, and frequency (Hz) (Banse and Scherer, 1996; Hildebrand et al., 2020; Pell and Kotz, 2011; Sauter et al., 2010). The study of these characteristics has provided evidence for their use to accurately index the valence and arousal of vocal expressions (e.g., Juslin and Scherer, 2005; Sauter et al., 2010). This has also led to the development of scale measures of positivity, negativity, confidence, and sincerity, as manifest vocally (Van Kleef et al., 2015; Van Zant and Berger, 2020; Zampetakis et al., 2017).

[3] Vocal expressions are a form of affective expression.

Table 1. Literature on vocal expressions

Article	Focus	Theory	Measures	DV	Key Findings
Receivers' perceptions of vocal expressions					
Banse & Scherer (1996)	Voice	N/A	Vocal expression of discrete emotions by actor; Acoustic profiles of those expressions	Decoding accuracy; Relationship between vocal characteristics and degree of intensity / difference of arousal	Judges are able to infer vocal expressions of emotion at a rate better than chance. Identified profiles of vocal characteristics for different emotions. These characteristics include aspects such as frequency, spectral energy, and speech rate, together indexing both valence and arousal.
Juslin & Laukka (2003)	Voice, Music (Meta-Analysis)	Basic Emotion Theory	Acoustic cues: pitch, intensity, temporal aspects, voice quality	Decoding accuracy	Vocal communication of emotion is accurate beyond chance both within-culture and cross-culturally. There seem to be emotion-specific patterns of vocal characteristics.
Sauter et al. (2010)	Voice	N/A	Participants categorized achievement/triumph; anger, amusement, contentment, sensual pleasure, relief, sadness, disgust, fear, or surprise. Separately, a Likert scale was used to evaluate valence and arousal of each expression.	Success in identifying sound (participants and acoustic properties)	Acoustic measures provided discrimination between expressions of emotion. Similar to the face, the perceived emotional character of vocal expressions can be predicted by their physical features (amplitude, pitch, spectral profile).
Pell & Kotz (2011)	Voice	N/A	Vocal expression of emotion: anger, disgust, fear, happiness, sadness. Rated by judges using Likert scale. Utterances drawn from existing inventory	Experiment. Participants' correct identification of emotion; time to recognize	At short time intervals, anger, sadness, fear, and neutral expressions are recognized more accurately compared to expressions of happiness and disgust.
Hildebrand et al. (2020)	Voice	N/A	N/A	N/A	Propose a four-dimensional conceptual framework of speech including time, amplitude, frequency, and spectral features. Illustrated how these dimensions might be related to speaker traits and emotional state.
Influence of vocal expressions					
Frese et al. (2003)	Charismatic leadership	Charismatic and visionary leadership	Trainees' charismatic inspirational communication via verbal and nonverbal expressions. Measures related to the voice: variation of speed, variation of loudness, positive statements, refraining from use of nonlexical utterances, clear pronunciation, artificial pauses	Improvement in metrics of charismatic inspirational communication after training. Variations of loudness	With training, managers improve their charismatic inspirational communication, thereby increasing peers' assessment of feeling inspired by one's speech. Variations of loudness in speech delivery are correlated with listeners' feeling inspired.
Towler (2003)	Charismatic leadership	Charismatic leadership/influence	Trainees' charismatic communication. Measure related to the voice: Animated voice tone	Improvement in declarative knowledge, self-efficacy of charismatic	With training, people develop declarative knowledge of charismatic communication and exhibit more charismatic influence behaviors; trainees use a more animated voice tone and use more analogies and stories. After training,

				communication, communication style	charismatic leadership trainees exhibited more charismatic behaviors when presenting than those in (a) a presentation skills group and (b) the control group (no training).
Tigue et al. (2012)	Voice	N/A	Experiment. Manipulated the vocal pitch (Hz) of US presidents' speeches	Perceived personality traits of speaker Physical perceptions of speaker Voting outcomes	Lower-pitched voices are associated with more favorable personality traits. Participants were more likely to vote for candidates with lower-pitched voices. Lower pitch is more associated with perceived physical strength of the speaker (rather than integrity) during war time.
Mayew et al. (2013)	Voice	N/A	Vocal pitch – objective in terms of frequency (Hz)	Labor market success	Male CEOs with deeper voices make more money, manage larger companies, and have longer tenures.
Van Kleef et al. (2015)	Voice, face	Emotions as social information	Happy and angry expressions via face and vocal tone	Attitude change in receiver	Positive (negative) expressions led to a positive (negative) change in receivers' attitude towards the expressor.
Klofstad (2016)	Voice	N/A	Objective measure of vocal pitch in terms of frequency (Hz)	Voter choice – experiment Election outcome - observational study	Candidates' vocal pitch influences election outcomes.
Lowe & Haws (2017)	Voice / Music	Cross-modal correspondence	Auditory pitch – voice and music Lab experiment – low and high frequency manipulations.	Perception of physical size	When associated with a product, lower vocal pitch (compared to high pitch) leads consumers to perceive a product as being physically larger.
Niebuhr et al. (2017)	Voice	Charismatic leadership	Acoustic/phonetic analysis; objective acoustic measures of vocal tone	Quantification of acoustic charisma metrics	Acoustic profiles of charismatic entrepreneurs versus less charismatic entrepreneurs in terms of pitch level (Hz), pitch range, loudness level and variability, phase duration, tempo, hesitation count and duration, and number of emphatic pitch accents/stresses. Speaking too fast or too slow decreases perceived charisma; a loud voice is better, but too loud of a voice decreases perceived charisma. Acoustic charisma training group (real-time feedback on acoustic metrics) outperformed video-feedback (viewing a video of a charismatic speaker) and no-feedback groups.
Zampetakis et al. (2017)	Imagery, Voice, Face, Words	Emotions as social information	Positive, negative anticipated emotions (words, voice, face) in film	Attitude towards entrepreneurship	Expressed positive emotion (a combination of vocal, behavioral, and visual stimuli), leads receivers to develop more positive attitudes toward entrepreneurship.
Van Zant & Berger (2020)	Voice	N/A	Volume, Pitch, Speech Rate	Persuasion	Changes in voice make one appear more confident, increasing persuasiveness.
Wang et al. (2021)	Voice	Stereotype content model	Objective measures using software Vocal characteristics: focus, stress, extreme emotion	Funding Success	Pitches with a voice showing greater signs of focus perform better; video pitches with a voice showing greater signs of stress or extreme emotion perform better, mediated by perceived competence and further influenced by characteristics of the pitch video.

Despite some evidence that vocal expressions convey information about expressers' affect and general notions that positive vocal expressions lead receivers to respond more favorably (Van Kleef et al., 2015; Zampetakis et al., 2017), little empirical research has examined how the valence and arousal of one's vocal expressions influence the perceptions and decisions of others. This has yielded relatively technical research that is disjointed from the theoretical foundation of affect and its dimensions of valence and arousal. Instead, research has tended to examine the influence of vocal characteristics in persuasion, finding, for example, that persuasive speech manner is a trainable element of charismatic leadership (Frese et al., 2003; Niebuhr et al., 2017; Towler, 2003), lower pitch (frequency) promotes positive perceptions and outcomes for managers and elected officials (Klofstad, 2016; Mayew et al., 2013; Tigue et al., 2012), and specific technical vocal characteristics (e.g., tempo, frequency, loudness) shape persuasiveness (Niebuhr et al., 2017; Van Zant and Berger, 2020).

Research on the influence of entrepreneurs' vocal expressions is also nascent. Recent work suggests that certain vocal tones may be associated with potential funders' perceptions of an entrepreneur's competence, influencing funding outcomes (Wang et al., 2021). The vocal tones examined by Wang and colleagues (2021), however, do not clearly align with established theoretical frameworks of affective expression, such as the two-dimensional model (valence and arousal; Russell et al., 2003). Instead, they use software that provides estimates of focus, stress, and stability of emotions from vocal tones. While entrepreneurship research recognizes that speaking with "varied tone and pitch" (e.g., Chen et al., 2009, p. 204) might be beneficial in funding pitches, this is the sole voice-specific item in a well-known measure of perceived passion. We review this literature below. In all of the studies we identified that include this item, it is packaged with other forms of nonverbal expressions that are evident in a live funding pitch or pitch competition (Chen et al., 2009), such as facial expressions and bodily gestures. Problematically, this way of capturing vocal expressions embeds the expectation that any variation in vocal tone is associated with perceptions of passion, leaving unexplored what specific vocal variations are associated with passion. Such measures also overlook how vocal

expressions relate to the broader literature on affective expression, reviewed above. Specifically, it is unclear how varied tone relates to the valence or arousal of the vocal expression in a pitch. Integrating the literature on vocal expressions with research on passion and preparedness suggests that, first, it is unlikely that "varied tone and pitch" is the only important vocal influence on perceptions of passion and that, second, the influence of vocal expressions on perceptions of preparedness has yet to be studied.

2.3. Perceptions of passion and preparedness

While many characteristics of pitching entrepreneurs are central in determining funding decisions (e.g., Drover et al., 2017; Huang and Pearce, 2015), perceptions of an entrepreneur's passion and preparedness may be the most widely studied (see Table 2). With limited exception (Chen et al., 2009), most work upholds the importance of perceived passion in shaping funding decisions (Davis et al., 2017; Li et al., 2017; Mitteness et al., 2012). Moreover, perceived passion has been shown to be a mechanism through which attributes of the entrepreneur influence funding outcomes (e.g., Oo et al., 2019). A potential funder's assessment of an entrepreneur's passion is influential because an entrepreneur's experience of passion is known to lead to greater effort and persistence (Cardon and Kirk, 2015; Murnieks et al., 2014). Funders use their perceptions of an entrepreneur's passion as a marker for other valued characteristics, such as tenacity, inspirational leadership, and commitment (Murnieks et al., 2014, 2016).

Funders also value preparedness, conceptualized as the entrepreneur's thoroughness and understanding regarding their venture, as conveyed in their pitch (Cardon et al., 2017; Chen et al., 2009). Perceptions of preparedness are contingent upon whether funders believe the pitch was delivered in a coherent and logical manner (Cardon et al., 2017; Chen et al., 2009; Pollack et al., 2012). When funders perceive an entrepreneur as prepared, this suggests that they have invested significant time and effort into their venture (Cardon et al., 2017; Chen et al., 2009), with associated inferences for the entrepreneur's ability to maximize venture success (Huang and Pearce, 2015).

Table 2. Literature on displayed/perceived passion and preparedness in entrepreneurship

Article	Focal Emotional Expression/ Perception	Measure of Perceived Passion/Preparedness	Evaluator of Perceived Passion/ Preparedness	IV(s)	DV(s)	Key Findings
Chen et al. (2009)	Perceived passion Perceived preparedness	Scale; voice 1 item as part of perceived passion	Students (Study 1), VCs, bankers, and others (Study 2)	Perceived passion: "the presenter(s) talked with varied tone and pitch" and "the presenter(s) had rich body language" are 2 of the 6 items. Perceived preparedness: "presentation content had substance" and "presentation was thoughtful and in-depth" are 2 of the 5 items.	Decision to invest (Study 1); evaluation of pitch in competition setting (Study 2)	Perceived preparedness (but not perceived passion) is positively related to observer evaluations.
Breugst et al. (2012)	Perceived passion for inventing Perceived passion for founding Perceived passion for developing	Scale; no items include voice	Current employees	The entrepreneur's perceived passion for inventing, founding, and developing. Adapted self-reported passion scales by Cardon et al. (2013).	Affective commitment (Employees)	Perceptions of the entrepreneur's passion for inventing and developing have a positive relationship with employees' commitment. Perceptions of the entrepreneur's passion for founding has a negative relationship. Employee positive affect at work and goal clarity mediate.
Mitteness et al. (2012)	Perceived passion	Scale; no items include voice.	Potential investors (Angel investors)	Perceived passion: "CEO is passionate about the company" and "CEO is very enthusiastic" comprise the 2-item scale.	Funding Potential (Angel Investors)	Perceived passion is positively related to funding potential. This relationship is moderated by individual-level characteristics of angel investors.
Pollack et al. (2012)	Perceived preparedness	Scale; no items include voice	Trained student coders	Perceived preparedness (Chen et al., 2009)	Funding amount (Dragon's Den & Shark Tank)	The relationship between perceived preparedness and funding is mediated by perceived cognitive legitimacy.
Galbraith et al. (2014)	Perceived passion Perceived preparedness	Scale; voice 1 item as part of perceived passion	Trained coders	Perceived passion (Chen et al., 2009) Perceived preparedness (Chen et al., 2009)	Change between pre- and post-presentation scores (US Department of Defense)	Passion and preparedness are related to higher post-presentation ratings. Passion and preparedness are related to greater audience attention and increased ratings of technology merit, management ability, and commercial potential.
Lucas et al. (2016)	Entrepreneurial passion Perceived passion	Scale; no items include voice Qualitative data from focus groups of investors	Entrepreneurs (experienced passion): Angel investors (perceived passion)	Entrepreneurial passion (new scale based on Cardon et al., 2013, and Vallerand et al., 2003). Perceived passion: "the entrepreneur appeared to be genuinely passionate about the venture" and "The entrepreneur communicated with passion	Perceived passion	Self-reports of entrepreneurial passion do not significantly correlate with investors' perceptions. The strongest indicators of entrepreneurial passion are presentation skills and rhetorical competence, including confident body language, vocal variety (inflection, word emphasis, word pronunciation, and pauses), personal engagement with investors (via eye contact,

				during the pitch" are 2 of the 4 items.		gestures, and a conversational style or tone), statements of passion (personal narratives, positive words, confident language).
Cardon et al. (2017)	Enthusiasm Preparedness Displayed Commitment	Scale; voice 1 item as part of perceived passion	Researchers (validated by investors)	Enthusiasm (Chen et al., 2009) Preparedness (Chen et al., 2009)	Funding potential (Angel investors)	There is a positive relationship between preparedness and funding potential, but no direct relationship of enthusiasm and funding potential. Entrepreneurs who display high enthusiasm receive lower evaluations of funding potential when they signal commitment through high personal investment of money and/or time.
Davis et al. (2017)	Perceived passion	Scale; voice 1 item as part of perceived passion	University students	Perceived passion (Chen et al., 2009)	Crowdfunding performance (Rewards-based)	The indirect relationship between perceived product creativity and crowdfunding performance (via funders' positive affective reactions) is (positively) moderated by perceived passion.
Li et al. (2017)	Displayed passion	Scale; no items include voice.	Undergraduate business students (Study 1); MBA students (Study 2)	Perceived passion (developed new scale).	Project funding; Project social Media exposure (Rewards-based crowdfunding)	Displayed passion is positively related to project funding and social media exposure. These effects are mediated by viewers' experienced enthusiasm and moderated (strengthened) by perceived innovativeness.
Jachimowicz et al. (2019)	Perceived passion	Scale; voice 1 item as part of perceived passion	Trained coders (Study 1 & 3, Dragon's Den videos); manipulation of passion (Study 2, vignette)	Perceived passion (Chen et al., 2009)	Study 1: Offered support (Dragon's Den); Study 2 & 3: Offered support (co-worker); Status conferral (co-worker)	Perceived passion has a positive relationship with offered support (both for funding and from co-worker) as well as status conferral (from co-worker). The relationship between passion and support (co-worker) is mediated by status conferral (co-worker).
Oo et al. (2019)	Perceived passion	Scale; voice 1 item as part of perceived passion	Researchers	Perceived passion (Chen et al., 2009)	Crowdfunding performance (Rewards-based)	Perceived passion mediates the relationship between being identified as a user-entrepreneur and crowdfunding performance. Perceived passion is positively related to crowdfunding performance.
Chan et al. (2020)	Perceived passion Perceived preparedness	Scale; voice 1 item as part of perceived passion	MTurk participants	Perceived passion (Chen et al., 2009) Perceived preparedness (Chen et al., 2009)	Daily pledged amount (Rewards-based crowdfunding)	Perceived passion and perceived preparedness each enhance the relationship between prior funding and campaign and subsequent contributions.
Murnieks et al. (2016)	Perceived obsessive passion	Experimental manipulation	Potential investors (angels)	Experimental manipulation of high/low obsessive entrepreneurial passion in conjoint profiles.	Probability of investing (Angels)	Angel investors value entrepreneurs who demonstrate both passion and tenacity, especially angels with more entrepreneurial experience.

Warnick et al. (2018)	Perceived entrepreneurial passion Perceived product passion	Experimental manipulation	Potential investors (Angels and VCs)	Conjoint manipulation of entrepreneurial passion (founding and developing) and product passion.	Probability of investment (Angels and VCs)	Investors differ in their consideration of product passion and entrepreneurial passion based on their investing experience and entrepreneurial experience. Entrepreneurs' passions have a stronger influence on funding when accompanied by high openness to feedback.
Lewis & Cardon (2020)	Perceived passion for product Perceived passion for growth	Experimental manipulation	Potential employees	Perceived passion. Conjoint manipulation adapted from Warnick et al. (2018).	Employer attractiveness (Employee)	Perceived passion (both for product and for growth) is positively related to employer attractiveness.
Dahlen et al. (2020)	Perceived brand passion	Experimental manipulation	Experimental manipulation	Experimental manipulation of brand passion (passionate language) in written advertisements.	Perceived product quality, experienced positive emotions, brand attitudes, purchase intentions, perceived brand effort	Brand passion in advertising increases consumers' purchase intentions and brand evaluations as mediated by perceived brand effort and emotional contagion of positive emotions.
Shane et al. (2020)	Displayed passion	Experimental manipulation	Pitch videos delivered by trained actors with high enthusiasm, including energy level, voice tone, spatial movement, and facial expressions	Displayed passion (high enthusiasm)	Neural engagement; investor interest	Entrepreneurs' display of passion increases informal investors' neural engagement and interest. Neural engagement may account for some of the effect of displayed passion on investor interest.
Stroe et al. (2020)	Experienced and expressed negative affect of pitching entrepreneur (moderated by harmonious and obsessive passion)	Facial analysis (to measure expression of negative affect); Scale to measure pitching entrepreneurs' experience of harmonious and obsessive passion	Pitching entrepreneur	Dispositional fear of failure (Houston & Kelly, 1987). Moderators include harmonious passion and obsessive passion (Vallerand et al., 2003)	Experienced negative affect (PANAS scale, Study 1); Expressed negative affect (Facial analysis, Study 2)	In pitch competitions, the relationship of entrepreneurs' dispositional fear of failure and negative affect is dampened by harmonious passion (Studies 1 & 2), whereas obsessive passion may either magnify (Study 1) or dampen (Study 2) this relationship (mixed evidence).

*Note: Table is organized by the type of measurement used, with scale-based studies listed before experimental manipulation studies, each in publication year, then alphabetical order.

** Prior research is inconsistent in the use of labels that reflect displayed passion versus perceived passion, especially in scale-based studies. The labels in this table reflect those used by the original researchers. Displayed passion most cleanly refers to observable aspects of an entrepreneur's pitch such as body language and facial expression (e.g., Cardon et al., 2017; Li et al., 2017; Shane et al., 2020), whereas perceived passion should be used for the perceptions investors hold for how passionate the entrepreneur is (e.g., Lucas et al., 2016; Mitteness et al., 2012). As Shane et al. (2020: 8) note, "Felt passion is passion experienced by an entrepreneur; displayed passion concerns the appearance of passion, such as 'appearing enthusiastic in their presentations' (Mitteness et al., 2012: 593); perceived passion pertains to how passionate external observers think an individual is." Perceived passion has at times been conceptualized in reference to affective manifestations of passion (perceived feelings of passion) and cognitive manifestations of passion (perceived preparedness in pitch delivery).

This literature review shows that little work has been done to understand how entrepreneurs' vocal expressions influence funders' perceptions of their preparedness and passion. Yet, evidence in other fields suggests that vocal expressions influence how speakers are perceived. For instance, the pitch of a political candidate's vocal expressions has been linked to voter turnout (Klofstad, 2016), as well as perceptions of competence, strength, and leadership capacity (Klofstad et al., 2012, 2015). In the following, we develop hypotheses linking vocal expressions to perceptions of preparedness and passion (as shown in Figure 1) by building on the foundation of the two-dimensional model of affect and the directly related theory of valence-arousal congruence.

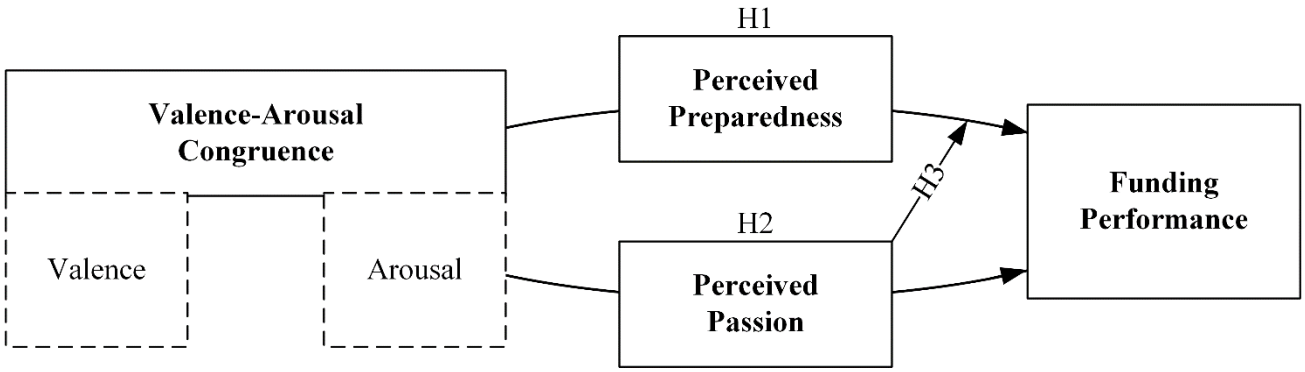


Figure 1. Hypothesized research model

3. Hypotheses

3.1. Valence-arousal congruence of affective expressions

Building on the two-dimensional model of affect and its recognition that valence and arousal are defining dimensions of affective expressions (Russell et al., 2003), a theory of valence-arousal congruence has begun to emerge. Research in this stream has, to date, been limited to lexical and visual stimuli (e.g., Citron et al., 2014a, 2016; Robinson et al., 2004; Wang et al., 2018; see Table 3 for a summary of this literature). Given the universality of valence and arousal as fundamental dimensions by which expressions are conceptualized, we argue for extending valence-arousal congruence theory to vocal expressions.

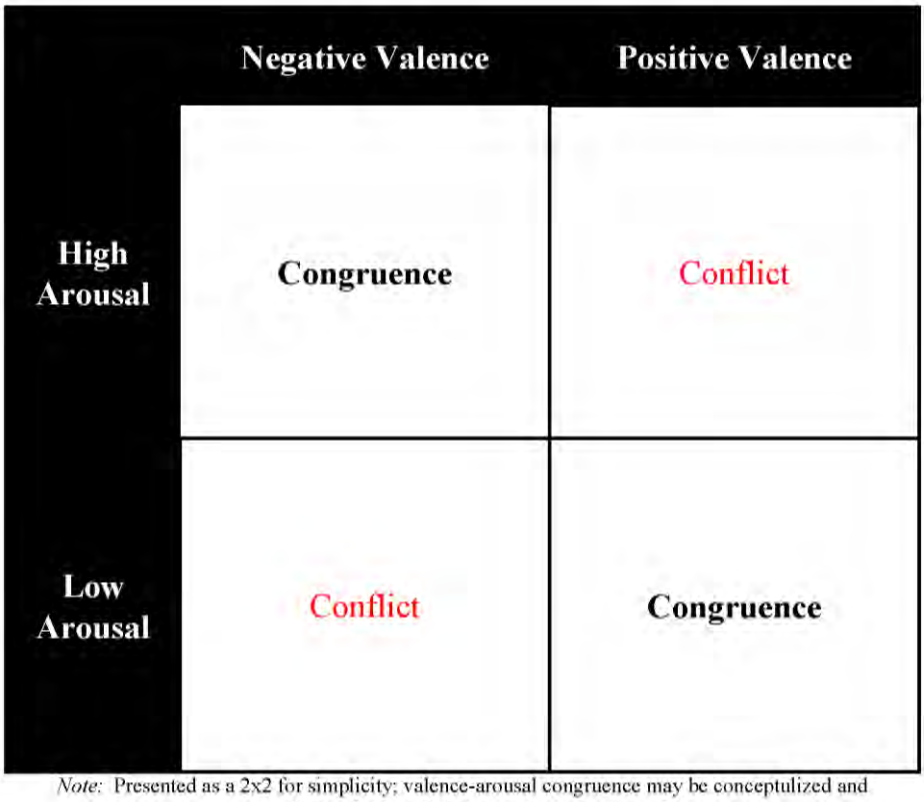
Table 3. Valence-arousal congruence theory literature

Article	Focus	Measures	DV	Key Findings
Robinson et al. (2004)	Emotional images; emotional words	Valence and arousal of words and images	Participant response time; latency in emotional feeling; motor performance	Response time is faster for negative high arousal stimuli and positive low arousal stimuli. Supports idea of a valence-arousal congruence theory.
Eder and Rothermund (2010)	Emotional images	Valence and arousal of images	Participant response time; evaluation accuracy	Faster and more accurate evaluation of positive or negativity or an image when its valence and arousal were congruent
Citron et al. (2014a)	Emotional words	Valence and arousal of words	Neural activation – fMRI experiment	Increased neural activation, suggesting greater cognitive load for stimuli with conflicting valence and arousal
Citron et al. (2014b)	Emotional words	Valence and arousal of words	Response time; accuracy in identifying word vs. non-word	Faster and more accurate response for valenced words compared to neutral words, but no difference between positive and negative words. Valence and arousal interact in word processing. Faster response times for words of valence-arousal congruence (low-arousal positive and high-arousal negative words).
Citron et al. (2016)	Emotional words	Valence and arousal of words	Participant subjective approach – withdrawal tendencies	Conflicting valence and arousal elicit conflicting action tendencies (approach vs. withdrawal).
Wang et al. (2018)	Emotional words; visual-spatial cues	Valence and arousal of words; approach – withdrawal tendency	Participant response time	Response time is influenced by congruence of valence and arousal. This effect was also found for congruence between valence, arousal, and response tendency.

Valence-arousal congruence theory proceeds from the assumption that, in addition to the positivity or negativity denoted by valence, arousal influences evaluation of a stimulus's positivity or negativity (Eder and Rothermund, 2010; Robinson et al., 2004). This is because high-arousal stimuli are associated with danger (negative), whereas low-arousal stimuli are presumed to be safe (positive) (Robinson et al., 2004). *Valence-arousal congruence* refers to instances in which the positivity or negativity of a stimulus's arousal reinforces the positivity or negativity of its valence (Eder and Rothermund, 2010)[4]. The opposite of valence-arousal congruence—v*alence-arousal conflict*—refers to instances in which the positivity or negativity of a stimulus's arousal conflicts with the positivity or negativity of its valence. For instance, a stray dog barking ferociously (negative valence and high arousal) is quickly and clearly

[4] Valence-arousal congruence is distinct and should not be confused with other forms of congruence in the literature (e.g., Clore and Schnall, 2005; Ravaja and Kätsyri, 2014).

evaluated as negative (i.e., valence-arousal congruence), whereas an injured stray dog (negative valence and low arousal) is more difficult to evaluate as positive (safe) or negative (dangerous) because its valence and arousal conflict (Robinson et al., 2004). In a similar vein, rollercoasters are often viewed as positive, but those that that are extremely intense (i.e., high arousal) introduce elements of negativity by virtue of their implicit association with danger, reflecting valence-arousal conflict (Robinson et al., 2004). As Figure 2 depicts, congruent valence-arousal combinations are negative valence, high arousal and positive valence, low-arousal; conflicting combinations are positive valence, high-arousal and negative valence, low-arousal.



Note: Presented as a 2x2 for simplicity; valence-arousal congruence may be conceptulized and operationized either dichotomously, or continously.

Figure 2. Integrative processing congruence vs conflict: Valence-arousal combinations

Humans are able to develop cognitive perceptions of affective stimuli, such as valence and arousal (Citron et al., 2014a; Robinson et al., 2004). As a result, the influence of valence and arousal likely occurs, at least in part, via cognitive pathways. Valence and arousal are evaluated independently through a preattentive process; however, conscious impressions cannot be formed or attributed to a stimulus until those evaluations are successfully integrated (Eder and

Rothermund, 2010). Theorizing and experimentation in this area demonstrates that integrating conflicting valence and arousal evaluations is a cognitive speedbump, increasing the effort needed to form clear impressions of a stimulus (Robinson et al., 2004). This has been evidenced through behavioral experiments (Citron et al., 2016; Robinson et al., 2004) and fMRI studies (Citron et al., 2014a). For instance, studying how quickly people process and categorize individual words based on their valence and arousal, Citron and colleagues (2014a) found that words characterized by valence-arousal conflict[5] led to "greater neural activation [i.e., increased cognitive strain] within the right insular cortex, in response to stimuli evoking conflict … compared to stimuli evoking [congruence]" (Citron et al., 2014a, p. 79). Consistent with the theorized integrative processing mechanism, this study demonstrated that words characterized by valence-arousal congruence elicit faster responses and fewer mistakes in categorization.

Valence-arousal congruence avoids integration slow-downs because less cognitive effort is required for integration when the evaluation of valence matches that of arousal (Eder and Rothermund, 2010). This is important, as the degree of effort required for evaluative processing influences the way receivers interpret and respond to a given stimulus (Citron et al., 2014a; Eder and Rothermund, 2010; Purkis et al., 2009; Wang et al., 2018). When less cognitive effort is required, receivers are more likely to develop positive perceptions of the stimulus and, in turn, to engage in desired behaviors toward the stimulus, such as resource exchange (e.g., Penz and Hogg, 2009). Alternatively, stimuli requiring greater cognitive effort can lead to confusion and the formation of adverse inferences (André et al., 2011). Frustration resulting from valence-arousal conflict may cause a potential funder to experience negative affect (Winkielman and Cacioppo, 2001), which is linked to detrimental outcomes in persuasion (e.g., Forgas, 1995) and entrepreneurial funding (e.g., Chan and Park, 2013).

3.2. Valence-arousal congruence promoting funding via perceived preparedness

[5] As a text-focused (i.e., linguistic affect) study, rather than a vocal affect study, conditions of valence-arousal conflict were high-arousal positive words and low-arousal negative words.

The theory of valence-arousal congruence offers an explanation for why the valence and arousal of entrepreneurs' vocal expressions (used in delivering their pitch) would influence funding via perceptions of their preparedness. Past work on preparedness has focused on the content of entrepreneurial pitches, suggesting that a pitch must provide a clear depiction of the venture and the qualifications of the entrepreneur (e.g., Chen et al., 2009; Clarke et al., 2019). In line with this, scholars propose that comprehensibility—in terms of the coherence and logical flow of a pitch as perceived by potential funders—is tied to perceptions of preparedness (e.g., Chen et al., 2009). Others have further suggested that comprehensibility may not only be a function of pitch content. "The manifestation of preparedness is often a well-delivered script," implying that "the entrepreneur [has] invested a significant amount of time" (Pollack et al., 2012, p. 919–920) and possesses the ability to succeed (Huang and Pearce, 2015). Thus, it would seem that perceptions of preparedness are not only a matter of *what* an entrepreneur says in a pitch but also *how* they say it. This makes sense, given that scholars in areas such as leadership (e.g., Antonakis, 2016; Degroot et al., 2011) and political science (e.g., Dietrich et al., 2019; Nagel et al., 2012) have long noted that the way one vocalizes a speech influences its reception (Van Zant and Berger, 2020).

We argue that, holding pitch content constant, perceptions of preparedness are promoted when the vocal expressions used to deliver a pitch are characterized by valence-arousal congruence, thereby increasing funding. Valence-arousal congruence facilitates coherence and clarity, which are fundamental to perceptions of preparedness (Cardon et al., 2017; Chen et al., 2009; Pollack et al., 2012). Congruence between valence and arousal at the integration stage of potential funders' evaluative processing eases the cognitive effort required to form clear and conscious perceptions of the pitch (e.g., Citron et al., 2014a, 2014b; Nygaard and Queen, 2008). In contrast, because greater cognitive effort in evaluation can elicit confusion and negative impressions (André et al., 2011), valence-arousal conflict in the vocal expressions used in a pitch may make it more difficult for funders to follow the entrepreneur's arguments, which funders could attribute to a lack of preparedness. Essentially, greater cognitive effort required by

valence-arousal conflict is akin to one's mind "freezing up," making it difficult to confidently make a decision or form a perception. Reflecting this processing difficulty, funders may be more likely to experience feelings of frustration in response to pitches delivered with vocal expressions characterized by valence arousal conflict (cf. Rothman and Wiesenfeld, 2007), an emotional response that is counter to the coherence and clarity that are central to preparedness. Thus, holding pitch content constant, we expect that entrepreneurs who deliver their pitch with vocal expressions that are characterized by valence-arousal congruence will be perceived as more prepared, increasing funding.

> *Hypothesis 1: When delivering a pitch, the valence-arousal congruence of entrepreneurs' vocal expressions is positively related to potential funders' perceptions of preparedness and, in turn, funding.*

3.3. Arousal of vocal expressions promoting funding via perceived passion

Entrepreneurs' vocal expressions may also influence funding by shaping perceptions of their passion. Passion is an intense positive feeling that entrepreneurs experience in relation to activities and roles important to their identity (Cardon et al., 2009). Passionate entrepreneurs often express emotion frequently and intensely (Cardon, 2008), influencing the extent to which they are perceived as passionate by potential funders (Chen et al., 2009; Li et al., 2017; Mitteness et al., 2012). Given that passion leads to greater effort and persistence (Cardon and Kirk, 2015; Murnieks et al., 2014), funders use their perceptions of an entrepreneur's passion as a marker for other valued characteristics, such as tenacity, inspirational leadership, and commitment to the venture (Murnieks et al., 2014, 2016). Reflecting this, perceived passion plays an important role in shaping funding decisions (Davis et al., 2017; Li et al., 2017; Mitteness et al., 2012; see Chen et al., 2009 for a notable exception).

Personal importance is central to conceptions of passion (Cardon et al., 2009; Vallerand et al., 2003) and the arousal of an emotion and/or its expression is perceived as an indicator of importance (Clore and Schnall, 2005). As a result, entrepreneurs may be perceived as more passionate to the extent that they speak with high-arousal vocal expressions. Passion has

generally been viewed as being displayed by entrepreneurs and perceived by others via positive, high arousal expressions (e.g., excitement, enthusiasm; Li et al., 2017; Mitteness et al., 2012), which mirrors the conception of entrepreneurial passion as an intense positive feeling (Cardon et al., 2009). Entrepreneurs who display intense positive expressions (e.g., excitement, enthusiasm, happiness) while engaged in activities related to their ventures, such as delivering a pitch, provide an indication of their venture-related positive feelings and motivation and are thus perceived as passionate about their ventures (Chen et al., 2009; Li et al., 2017; Mitteness et al., 2012). A significant body of empirical evidence supports the idea that passion is expressed by entrepreneurs and perceived by others via high-arousal positive expressions (e.g., Breugst et al., 2012; Cardon et al., 2017; Chen et al., 2009; Li et al., 2017; Mitteness et al., 2012).

Extending prior work's emphasis on high-arousal *positive* expressions, we argue that entrepreneurs' high-arousal *negative* expressions are also perceived by others as indicative of passion. Passion scholars have noted that the experience of passion may be attended not only by positive feelings, but also negative feelings, especially for those with an "obsessive" passion, such that the urge to enact their passion is uncontrollable (Vallerand et al., 2003). Further, Chen and colleagues (2009, p. 201) note that, "Although the passion experience is largely positive (Busenitz and Barney, 1997), it does not exclude negative affective states such as anxiety or fear, since people can hold ambivalent emotions." This view that passion can be associated with both positive and negative affect (Pollack et al., 2020) highlights the potential for entrepreneurial passion to be perceived by others based on high-arousal negative expressions in addition to high-arousal positive expressions.

We propose that entrepreneurs engender perceptions of their passion by speaking with high-arousal negative vocal expressions—which might be described as more serious and reflective of a fiery determination—in addition to speaking with an upbeat, enthusiastic vocal tone. Passion scholars have often described feelings and expressions of passion by invoking imagery of fire (e.g., Cardon and Murnieks, 2020; Li et al., 2017; Murnieks et al., 2016), suggesting that such a "fiery" negative vocal tone might be perceived as passionate. In a similar

vein, emotion scholars have found that determination, which shares substantial conceptual similarity with passion given its intense motivational qualities, is expressed and perceived via negative, high-arousal expressions (Harmon-Jones et al., 2011). Investors' use of their perceptions of an entrepreneur's passion as a marker for such motivational qualities (e.g., tenacity, commitment; Murnieks et al., 2016) may be because negative affect can provide an energizing force that fuels creative thinking (George and Zhou, 2002) and directs attention toward solving problems (Elfenbein, 2007). For example, research has found that entrepreneurs use high-arousal negative (facial) expressions in a pitch when highlighting their determination to solve a problem and the personal importance they place on their venture (e.g., Warnick et al., 2021). This suggests that vocal expressions that are high arousal and negative might also encourage potential funders to cognitively perceive pitching entrepreneurs as passionate. We contend that high-arousal expressions of positive or negative valence engender perceptions of passion, thereby increasing funding.

> *Hypothesis 2: When delivering a pitch, the arousal of entrepreneurs' vocal expressions—including those of positive valence and negative valence—is positively related to potential funders' perceptions of passion and, in turn, funding.*

3.4. Complementary influence of perceived passion and perceived preparedness on funding

Entrepreneurs' passion and preparedness are typically conceptually viewed as complementary (Cardon et al., 2017; Chen et al., 2009). Yet, a mechanism for the complementary nature of perceived passion and perceived preparedness among potential pitch funders has not been explicitly theorized in prior work, though it has been tested indirectly. In their study of angel investors, Cardon and colleagues (2017) used trained coders to measure displayed *enthusiasm*—an emotion often associated with passion—and preparedness, and tested their interaction on funding but did not formally hypothesize this relationship, nor find support for it. Importantly, their measure of enthusiasm captured energetic behaviors that were displayed by entrepreneurs (e.g., energetic body movements, animated facial displays, rich body language; Chen et al., 2009), rather than investor perceptions of an entrepreneur's passion (e.g., Mitteness

et al., 2012; Li et al., 2017). As noted in Table 2, such distinctions between felt, displayed, and perceived passion are important (Mitteness, et al., 2012; Shane et al., 2020).

We argue that funding is more likely to occur to the extent that entrepreneurs are perceived as both passionate and prepared. Conceptually, this complementarity arises because entrepreneurs must be equipped with both motivation and ability to effectively seize entrepreneurial opportunities (Shane et al., 2003). While perceptions of entrepreneurs' passion suggest their motivation to act in pursuit of venture success, preparedness suggests their ability to do so. Given that perceived passion and perceived preparedness reflect such motivation and ability, respectively (e.g., Pollack et al., 2012), each should increase the appeal of the other. As a result, we contend that when perceptions of passion and preparedness are coincident, they together suggest an ability to apply motivation in a way conducive to venture success, thus increasing funding.

Hypothesis 3: The extent to which an entrepreneur is perceived to be both passionate and prepared is positively related to funding.

4. Study 1: Experiment

4.1. Development of experimental stimuli

Our theorizing predicts that an entrepreneur's vocal expressions in pitch delivery shape funders' perceptions of passion and preparedness. The voice has particular relevance to pitch videos because they unbundle the channels of affective expression and the voice is often the only continuous channel of affective expression. Thus, we chose the context of rewards-based crowdfunding (Allison et al., 2017), which involves online, video-based funding pitches for our studies. In Study 1, we conducted a between-subjects experiment wherein we used the same pitch script across experimental conditions but varied the valence and arousal of the vocal tone used to deliver the pitch. The script and the experimental stimuli (pitch video) were developed from a real-world crowdfunding pitch drawn from an archival Kickstarter sample (used in Study 2, described below), a choice made to enhance ecological validity. For the same reason, a pitch for a service that offered travel information via mobile phone was selected, given its broad

relevance (95% of the American population own mobile phones; Pew, 2018; the experiment was conducted prior to the COVID-19 pandemic).

A transcript from the pitch was edited to reduce the potential influence of the pitch's words—in terms of their valence and arousal—on funder perceptions (e.g., Imbir, 2017). We achieved the editing process through the use of computer-aided text analysis software. The valence and arousal values for words used in the pitch were measured using the affective norm values associated with each word (Bradley and Lang, 1999). Prior studies have developed valence and arousal ratings for several thousand common words, using a large number of raters (e.g., Bradley and Lang, 1999; Warriner et al., 2013; Westbury et al., 2015). We used the largest and most recent affective norms list to provide continuous ratings of valence and arousal for 23,211 words (Westbury et al., 2015). Using these objective measurements, we then replaced highly positive or highly negative words, as well as those especially high or low in arousal, with neutral words. The resulting neutral script was used in all four experimental conditions.

A professionally trained actor was hired to deliver this neutral funding pitch transcript (see Appendix A) with different combinations of vocal valence and arousal. Four versions were recorded: positive and negative vocal valence with low and high vocal arousal, respectively. These combinations were constructed in accordance with the two-dimensional structure of affect, with scholars' descriptions of these combinations serving as a guide for the actor's delivery (Russell, 2003; Yik et al., 2011). The actor was instructed to deliver the pitch with (1) a very enthusiastic, highly excited vocal tone (high-arousal positive vocal expression condition), (2) a serious, "fiery," determined vocal tone (high-arousal negative vocal expression condition), (3) a sad, somber, gloomy vocal tone (low-arousal negative vocal expression condition), and (4) a friendly, warm, calm vocal tone (low-arousal positive vocal expression condition).

To ensure that the actor's delivery was consistent with the instructions given, two manipulation checks were performed for each of the four conditions. These are described in Appendix B. Both checks indicated that the manipulation for each condition was successful. We used professional video editing software to create the final stimulus for each condition. To avoid

lip synchronization issues and to remove confounding influences from facial expressions (e.g., Jiang et al., 2019; Warnick et al., 2021), we deleted video segments in which the entrepreneur's face was visible, leaving only video segments that included depiction of the product, with the vocal delivery of the hired actor (described above) serving as a voiceover. The original entrepreneur's voice was replaced with the actor's vocal delivery to maintain equivalency across pitch conditions in the script, video, and two-minute duration. Taken together, these efforts contribute to the experiment's overall ecological validity.

4.2. Experiment sample and procedure

We recruited a sample of 320 participants from Amazon Mechanical Turk, which enables researchers to recruit participants from the general public. Past work has demonstrated that the internal and external validity of experiments using participants from this platform are comparable to those using traditional participant pools (Berinsky et al., 2012; Buhrmester et al., 2011). Specific criteria in our research design also made this the optimal choice for recruiting participants. Because funders are generally laypersons from a non-specialist population of internet users (e.g., Davis et al., 2017; Scheaf et al., 2018), the participants from this platform are representative of those drawn to crowdfunding. Both are crowd-based platforms, where interaction is physically distant and asynchronous, making the experimental setting similar to the real-world setting. Our participants were also more diverse than those generally found in student pools; as such, their demographics aligned better with crowdfunders.

Nine participants were excluded due to incomplete data, resulting in a sample size of 311. The participants were 36.70 years old on average (ranging from 20 to 70 years old), with an average of 14.44 years of work experience. All were native English speakers, 194 (62.38%) were men, 174 (55.95%) had a bachelors or higher degree, and all had at least a high school education. We constrained our sampling frame to match the background of crowdfunders; participants had funded at least one crowdfunding campaign (e.g., Allison et al., 2017) and had funded an average of 3.66 crowdfunding campaigns. U.S. residents were chosen since most crowdfunders live in

the U.S. (Allison et al., 2017). Overall, this participant profile is consistent with recent research (e.g., Allison et al., 2017; Chan et al., 2020; Rose et al., 2020).

Participants were randomly assigned to one of the four conditions of vocal valence and arousal. Participants were tasked with watching one pitch video and providing an evaluation of perceived preparedness, perceived passion, and funding intentions. The four conditions of vocal expressions were: (1) low-arousal negative expressions (n = 80), (2) low-arousal positive expressions (n = 79), (3) high-arousal negative expressions (n = 74), and (4) high-arousal positive expressions (n = 78).

4.3. Measures

4.3.1. Dependent variable

Following prior crowdfunding work (e.g., Wang and Yang, 2019) and in alignment with entrepreneurial pitch research (e.g., Baron et al., 2006), funding was operationalized as funding intentions, measured as the mean of participants' indications of (1) whether they would back the project, (2) whether they would back the project assuming they were in the market for the pitched product, and (3) their assessment of project quality (Allison et al., 2017). Each item used a five-point scale from 1 (strongly disagree) to 5 (strongly agree) (Cronbach's $\alpha = .95$).

4.3.2. Perceived passion

We measured funders' perceptions of the entrepreneur's passion by taking the mean of six items employed by Li, Chen, Kotha, and Fisher (2017). Example items include that the entrepreneur "appears to be passionate about the project idea" and "displays an urge to complete the project" (Li et al., 2017). Each item was measured on a five-point scale from 1 (strongly disagree) to 5 (strongly agree) (Cronbach's $\alpha = .98$). In contrast with Chen and colleagues' (2009) scale of *displayed* passion, which accounts for various animated behaviors during pitches where the entrepreneur is visible, Li and colleagues' (2017) scale does not rely on facial expressions and body movements/gestures (which are not visible in our experimental conditions as we sought to isolate vocal expressions) and accounts for observers' perceptions of what the entrepreneur feels, thus measuring *perceived* passion (cf. Shane et al., 2020). Thus, the Li and

colleagues scale (2017) is highly amenable to pitch videos, whereas the Chen and colleagues scale (2009) would have resulted in missing information given that facial expressions and body gestures were not visible in our study since its focus is on displayed, rather than perceived, passion.

4.3.3. Perceived preparedness

We assessed funders' perceptions of the entrepreneur's preparedness in the pitch using Chen, Yao, and Kotha's (2009) scale of perceived preparedness. This scale includes five items, including, "The presentation was coherent and logical" and "The presentation was thoughtful and in depth." Each item was measured on a five-point scale from 1 (strongly disagree) to 5 (strongly agree) (Cronbach's $\alpha = .90$). We used the mean of the five items in our analysis.

4.4. Results

4.4.1. Overview of mean differences in pitch conditions

Table 4 provides results and all post-hoc pairwise mean comparisons (Tukey HSD was used for multiple comparisons)—including perceived passion, perceived preparedness, and funding intentions—among the four pitch conditions in our experiment. Results of a one-way between-subjects ANOVA analysis confirmed significant differences among the pitch conditions for perceived passion [$F(3, 307) = 199.97$, $p < .001$], perceived preparedness [$F(3, 307) = 5.26$, $p < .01$], and funding intentions [$F(3, 307) = 11.06$, $p < .001$]. Figure 3 depicts these differences.

Differences in perceived preparedness were consistent with our theorizing (Hypothesis 1). Participants in the valence-arousal congruence conditions (high-arousal negative condition and low-arousal positive condition) perceived the entrepreneur to be 13.42% higher in preparedness compared to those in the valence-arousal conflict conditions (valence-arousal congruence conditions combined: $M = 3.68$, $SD = 0.96$; valence-arousal conflict conditions combined: $M = 3.25$, $SD = 0.99$; $p < .001$). Mean perceived preparedness was higher for each valence-arousal congruence condition (low-arousal positive condition: $M = 3.64$, $SD = 0.97$; high-arousal negative condition: $M = 3.73$, $SD = 0.96$) compared to each valence-arousal conflict condition (high-arousal positive condition: $M = 3.27$, $SD = 1.03$; low-arousal negative condition:

M = 3.22, *SD* = 0.96). These pairwise comparisons differed significantly in the expected direction with *p*-values of .05 or less, except for the higher mean of the low-arousal positive condition compared to the high-arousal positive condition ($p = .09$). Perceived preparedness did not significantly differ between the two valence-arousal congruence conditions ($p = .93$).

Table 4. Study 1 – Funding intentions, perceived passion, and perceived preparedness differences by pitch vocal condition

		Funding Intentions		Perceived Passion		Perceived Preparedness	
Pitch Vocal Condition	**N**	**Mean**	***SD***	**Mean**	***SD***	**Mean**	***SD***
Low-Arousal Negative Expressions	80	2.08	1.17	1.65	1.00	3.22	0.96
Low-Arousal Positive Expressions	79	2.99	1.26	3.35	1.08	3.64	0.97
High-Arousal Negative Expressions	74	3.17	1.33	4.53	0.62	3.73	0.96
High-Arousal Positive Expressions	78	2.56	1.39	4.59	0.62	3.27	1.03
Total	311	2.69	1.35	3.50	1.48	3.46	1.00

		Funding Intentions		Perceived Passion		Perceived Preparedness	
(I) Pitch Vocal Condition	**(J) Pitch Vocal Condition**	**Mean Difference (I-J)**	***SE***	**Mean Difference (I-J)**	**SE**	**Mean Difference (I-J)**	***SE***
Low-Arousal Negative Expressions	Low-Arousal Positive Expressions	-0.91***	0.20	-1.69***	0.14	-0.42*	0.16
	High-Arousal Negative Expressions	-1.09***	0.21	-2.88***	0.14	-0.51**	0.16
	High-Arousal Positive Expressions	-0.48†	0.21	-2.94***	0.14	-0.06	0.16
Low-Arousal Positive Expressions	High-Arousal Negative Expressions	-0.18	0.21	-1.18***	0.14	-0.09	0.16
	High-Arousal Positive Expressions	0.43	0.21	-1.25***	0.14	0.36†	0.16
High-Arousal Negative Expressions	High-Arousal Positive Expressions	0.61*	0.21	-0.07	0.14	0.46*	0.16
High-Arousal Conditions Combined[a]	Low-Arousal Conditions Combined	0.32*	0.15	2.07***	0.12	0.07	0.11
Valence-Arousal Congruence Conditions Combined[b]	Valence-Arousal Conflict Conditions Combined[c]	0.76***	0.15	0.81***	0.16	0.44***	0.11

† $p < .100$
* $p < .050$
** $p < .010$
*** $p < .001$

Notes: $N = 311$; post-hoc multiple comparisons of mean differences used the Tukey HSD test; perceived passion and perceived preparedness had a bivariate correlation of .266.

[a]high-arousal conditions are the low-arousal positive condition and the high-arousal negative condition;

[b]valence-arousal congruence conditions are the low-arousal positive condition and the high-arousal negative condition;

[c]valence-arousal conflict conditions are the high-arousal positive condition and the low-arousal negative condition.

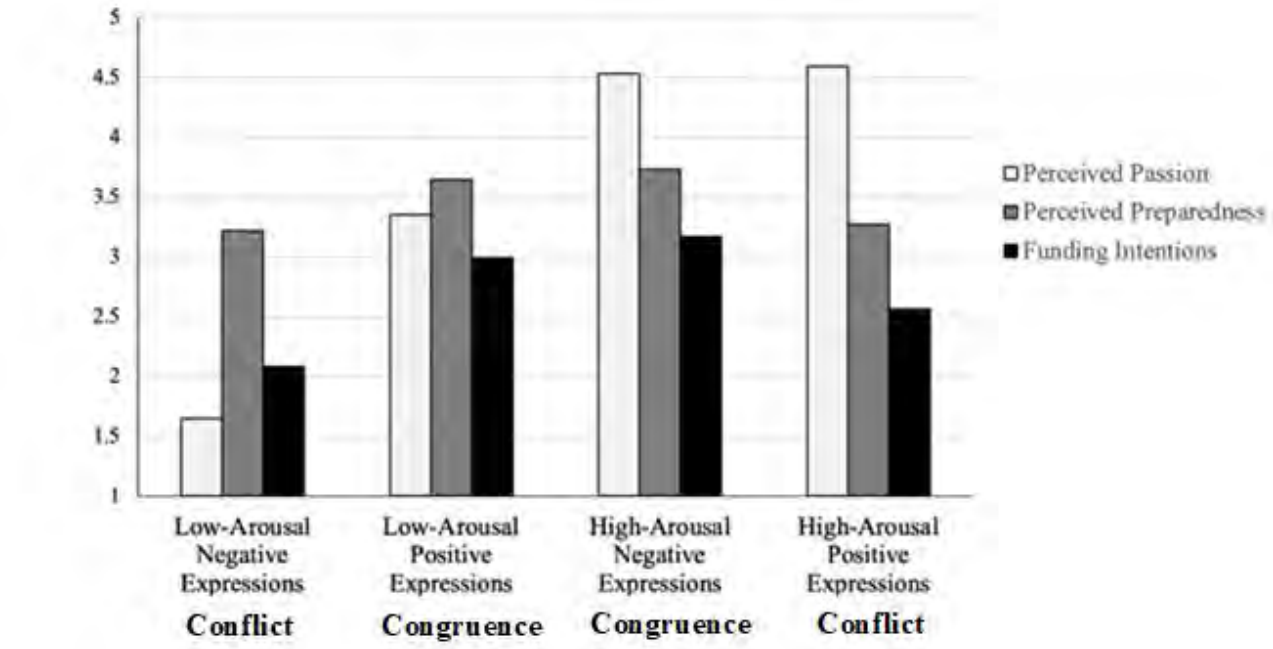


Figure 3. Study 1 – Mean differences between pitch conditions: Valence and arousal of vocal expressions in pitch delivery

Differences in perceived passion were also consistent with our theorizing (Hypothesis 2). Participants in the high-arousal conditions, including both positive and negative valence, rated perceived passion 82.92% higher than those in the low-arousal conditions (high-arousal conditions combined: $M = 4.56$, $SD = 0.62$; low-arousal conditions combined: $M = 2.49$, $SD = 1.34$; $p < .001$). Mean perceived passion was significantly higher ($p < .001$) for each high-arousal condition (high-arousal positive condition: $M = 4.59$, $SD = 0.62$; high-arousal negative condition: $M = 4.53$, $SD = 0.62$) compared to each low-arousal condition (low-arousal positive condition: $M = 3.35$, $SD = 1.08$; low-arousal negative condition: $M = 1.65$, $SD = 1.00$). Mean perceived passion did not significantly differ between the two high-arousal conditions ($p = .96$).

4.4.2. Indirect effects on funding via perceived preparedness and perceived passion

Table 5 reports our mediation analysis, conducted with the PROCESS macro, following Hayes and Preacher (2014). We analyzed the indirect effects of multiple parallel mediators (perceived passion and perceived preparedness) by categorical predictor (pitch vocal condition). Modeling perceived passion and perceived preparedness in parallel accounted for the effect of each of these mediators while controlling for the other.

Table 5. Study 1 – Effect of vocal valence and arousal on funding intentions via perceived passion and perceived preparedness

Pitch Vocal Condition (Independent Variable)	Mediator[a]	Valence & Arousal → Funding Intentions		Valence & Arousal → Mediator		Mediator → Funding Intentions		Relative Indirect Effect			
										95% Confidence Interval	
		Effect	*SE*	Effect	*SE*	Effect	*SE*	Effect	*SE*	Lower	Upper
Reference Group: Low-Arousal Negative Expressions[b]											
High-Arousal Negative Expressions	Perceived Passion	-0.33	0.22	2.87***	0.14	0.35***	0.06	1.01	0.21	0.61	1.44
High-Arousal Positive Expressions		-0.60**	0.23	2.94***	0.14			1.03	0.22	0.62	1.49
Low-Arousal Positive Expressions		-0.02	0.17	1.69***	0.14			0.59	0.13	0.35	0.88
High-Arousal Negative Expressions	Perceived Preparedness			0.51**	0.16	0.81***	0.05	0.41	0.13	0.18	0.66
High-Arousal Positive Expressions				0.06	0.16			0.05	0.13	-0.19	0.29
Low-Arousal Positive Expressions				0.41**	0.16			0.34	0.12	0.10	0.59
High-Arousal Conditions Combined[c] (Reference Group: Low Arousal Conditions Combined)	Perceived Passion	-0.44***	0.15	2.07***	0.12	0.34***	0.05	0.70	0.12	0.48	0.94
Valence-Arousal Congruence Conditions Combined[d] (Reference Group: Valence-Arousal Conflict Conditions Combined)	Perceived Preparedness	0.22*	0.11	0.44***	0.11	0.84***	0.05	0.37	0.09	0.18	0.55

† $p < .100$
* $p < .050$
** $p < .010$
*** $p < .001$

Notes: $N = 311$; indirect effect results based on 5000 bootstrap samples using the method outlined by Hayes and Preacher (2014) method for parallel multiple mediators with a categorical independent variable;
[a]analysis of the effects of perceived passion control for perceived preparedness and vice versa;
[b]multicategorical testing used;
[c]high-arousal conditions are the high-arousal positive condition and the high-arousal negative condition;
[d]valence-arousal congruence conditions are the low-arousal positive condition and the high-arousal negative condition.

Supporting Hypothesis 1, the two valence-arousal congruence conditions exhibited a significant indirect effect on funding intentions via perceived preparedness relative to the two valence-arousal conflict conditions (B = 0.37, CI = 0.18, 0.55). Comparing these conditions individually provided further support for Hypothesis 1. With the low-arousal negative condition as a reference, we found significant indirect effects via perceived preparedness for both valence-arousal congruence conditions (low-arousal positive condition: B = 0.34, CI = 0.10, 0.59; high-arousal negative condition: B = 0.41, CI = 0.18, 0.66). These indirect effects via perceived preparedness were also significant when using the high-arousal positive condition—the other condition of valence-arousal conflict—as a reference (low-arousal positive condition: B = 0.29, CI = 0.04, 0.54; high-arousal negative condition: B = 0.36, CI = 0.12, 0.61).

Supporting Hypothesis 2, the two high-arousal conditions combined had a significant indirect effect on funding intentions via perceived passion relative to the low-arousal conditions (B = 0.70, CI = 0.48, 0.94). We also compared these indirect effects individually, further supporting Hypothesis 2. With the low-arousal negative condition as a reference, we found significant indirect effects on funding intentions via perceived passion for both high-arousal conditions (high-arousal negative condition: B = 1.01, CI = 0.61, 1.44; high-arousal positive condition: B = 1.03, CI = 0.62, 1.49). These indirect effects were also significant when using the low-arousal positive condition as a reference (high-arousal negative condition: B = 0.45, CI = 0.28, 0.67; high-arousal positive condition: B = 0.48, CI = 0.29, 0.71).

4.4.3. Effects of perceived passion and perceived preparedness on funding

Hypothesis 3 proposed an interaction effect of perceived passion and perceived preparedness on funding. We regressed the direct and interactive effects of perceived passion and preparedness on funding intentions (Table 6). As expected, these mediators increase funding. We found main effects on funding intentions for perceived passion *(*B = 0.25, SE = 0.04, $p < .001$; Model 2) and perceived preparedness *(*B = 0.85, SE = 0.05, $p < .001$; Model 2), in addition to their interaction (B = 0.15, SE = 0.03, $p < .001$; Model 3; Hypothesis 3).

Table 6. Study 1 – Effects of perceived passion, perceived preparedness, and their interaction on funding intentions

Dependent Variable: Funding Intentions	**Model 1**		**Model 2**		**Model 3**	
Variables	***B***	***SE***	***B***	***SE***	***B***	***SE***
Constant	2.69***	0.07	2.69***	0.05	2.64***	0.05
Perceived Passion	0.41***	0.05	0.25***	0.04	0.27***	0.04
Perceived Preparedness			0.85***	0.05	0.85***	0.05
Perceived Passion × Perceived Preparedness					0.15***	0.03
R^2	0.19		0.56		0.58	
F Change	71.23***		257.26***		17.92***	

* $p < .050$
** $p < .010$
*** $p < .001$

Notes: $N = 311$; perceived passion and perceived preparedness were mean-centered.

Supporting Hypothesis 3, Figure 4 plots this interaction. Perceived passion has a stronger relationship with funding intentions to the extent that it is accompanied by perceived preparedness. The slope of perceived passion is significant at low perceived preparedness (-1*SD*; simple slope = 0.12; $p < .01$) and high perceived preparedness (+1*SD*; simple slope = 0.42; $p < .001$); the simple slope of passion on funding intentions was 3.50 times greater when accompanied by high (+1*SD*) rather than low (-1*SD*) perceived preparedness.

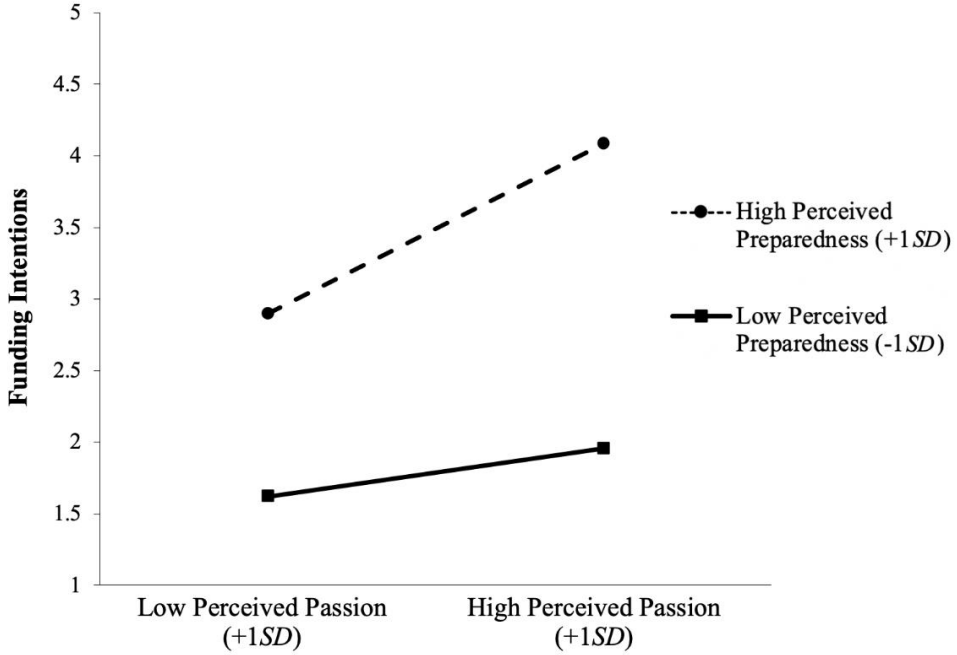


Figure 4. Study 1 – Interaction of perceived passion and perceived preparedness

4.4.4. Post-hoc test: Affective reactions

In addition to the cognitive effects of vocal expressions via perceived passion and perceived preparedness, vocal expressions may influence funding via funders' affective reactions. Valence-arousal congruence may increase funders' positive affect by making the pitch easier to understand, whereas pitches delivered with valence-arousal conflict may result in negative affect and, as a result, adverse assessments of funding (cf. André et al., 2011; Chan and Park, 2013). Moreover, high-arousal expressions might increase funders' arousal through a process of emotional contagion (Hatfield and Cacioppo, 1993), energizing them to take more action than they would otherwise, thereby increasing funding. To test these indirect effects via funders' affective reactions, we conducted additional mediation tests using the PROCESS macro (Hayes and Preacher, 2014). Pitch vocal condition served as a categorical predictor with multiple parallel mediators, the valence and arousal of funders' affective reactions. We measured the valence of participants' affective state after viewing the pitch on a scale from 1 (extremely unpleasant) to 9 (extremely pleasant) and their arousal after viewing the pitch on a scale from 1 (extremely sleepy) to 9 (extremely aroused) (cf. Yik et al., 2011).

We first analyzed the effect of valence-arousal congruence on funding intentions via the positivity of participants' affective reactions. Compared to participants in the valence-arousal conflict conditions, those in the valence-arousal congruence conditions reported a more positive affective state ($B = 1.74$, $SE = 0.22$, $p < .001$), which, in turn, increased their funding intentions ($B = 0.21$, $SE = 0.03$, $p < .001$). This relationship was confirmed as a significant indirect effect ($B = 0.36$, $CI = 0.24, 0.49$). Tests of the indirect effects of each valence-arousal congruence condition individually compared to each valence-arousal congruence condition also showed significant indirect effects via the positive valence of participants' affective reactions, with positive confidence intervals that did not cross zero.

We then analyzed the effect of high-arousal vocal conditions on funding intentions via the arousal of participants' affective reactions. Compared to the low-arousal conditions, participants in the high-arousal conditions reported higher arousal after viewing the pitch ($B =$

1.80, *SE* = 0.22, $p < .001$), which increased their funding intentions (*B* = 0.17*, SE* = 0.03, $p < .001$). This relationship was confirmed as a significant indirect effect (*B* = 0.30, *CI* = 0.17, 0.44). Tests of the indirect effects of each high-arousal condition individually compared to each low-arousal condition also showed significant indirect effects via the participants' increased arousal, with positive confidence intervals that did not cross zero. Together, these results are consistent with prior findings that receivers' experience of positivity and/or high arousal promotes positive attitudes to persuasive appeals (Davis et al., 2017).

Results were robust when using the difference between the participants' pre- versus post-pitch affective state valence and when controlling for perceived passion and perceived preparedness. In addition, when controlling for the valence and arousal of participants affective reactions, our hypothesized indirect effects via perceived passion and perceived preparedness remained significant and in the same direction as our prior analyses.

5. Study 2: Speech affect analysis

5.1. Data

In addition to our experiment (Study 1), we conducted a study using archival data to examine the external validity of our findings. Consistent with previous research, we drew our sample from Kickstarter (Allison et al., 2017). Our sampling frame included all Kickstarter crowdfunding campaigns launched between 2009 and 2016 that included a video, from which we randomly selected 1,000 campaigns. Roughly half lacked a funding pitch or featured a video that lacked speech (e.g., movie trailers). Removing these yielded our final sample of 558 campaigns. We compared the dependent and control variables of this sample to the sampling frame. There were no significant differences between our sample and the population, with the exception of the fundraising goal, which was higher in the population than in our sample. This difference was attributed to the presence of 19 campaigns in the population that set funding goals of exactly US$100 million. Examination of these campaigns in the population suggested these goals were unserious fundraising attempts.

5.2. Measures

5.2.1. Dependent variable

We operationalized funding via the continuous measure funds pledged (Li et al., 2017). Average funds pledged was US$12,243 (*SD* = US$47,531) with a range from US$0 to US$652,001 and a median of US$2,653. Funds raised tend to be positively skewed in all contexts, because most ventures raise little or nothing, with a small number of ventures that raise outsized amounts. Both are meaningful outcomes, not outliers indicative of measurement error; we thus used the natural logarithm of funds pledged as our dependent variable.

5.2.2. Valence and arousal: Speech affect analysis

Testing our hypotheses requires capturing vocal expressions in terms of vocal valence and vocal arousal. The most suitable method for achieving this goal is through speech affect analysis (SAA) software. Such software is a subset of the broader category of computer audio analysis software, which converts audio files (typically sound encoded as a digital bitstream) into statistics about the audio. This approach measures vocally expressed affect via the frequency of sound waves (in Hertz), timing the intervals that exist between changes in frequency, and observing patterns and aberrations that materialize in those changes (Banse and Scherer, 1996; Johnstone and Scherer, 2000). Once captured, these vocal characteristics are compared with prosodic patterns and affective constructs that have been previously observed and categorized.

Whereas prior research has often employed raters and judges to rate the affect of speech, this has been done for short audio snippets and individual utterances and sounds. Due to the length of funding pitches, computer-based measures provide a superior solution. Computers are not only capable of much greater frequency discrimination, but also possess vastly superior timing accuracy (e.g., Siegert et al., 2014). Software doesn't tire and isn't biased by the words in the speech or rater affective state. Moreover, computer-based measures allow comparison of vocal utterances with prosodic examples, linked to affective constructs based on ratings of thousands of human coders, rather than the one to three coders common to other forms of rating affective expressions.

Before discussing software packages for measuring affect from speech, we must note that speech affect analysis consists of software classifiers that process the output of speech/voice analysis software to measure technical characteristics of the human voice. Most voice analysis software only performs this lower-level audio analysis. The most well-known example of audio analysis software is Praat (Juslin and Scherer, 2005). The produced analysis consists of vocal characteristics such as pitch, rate of speech, loudness, and characteristics derived from the timing and changes in these. These characteristics are inputs into many streams of vocal research. Among these are efforts to develop and improve ways of using these characteristics to classify affect through the voice (e.g., Banse and Scherer, 1996).

A number of software packages are available for measuring affect from speech. In selecting a package, it is important to both understand what a package measures and its validity. One important consideration is that some software packages, such as the IBM Watson Tone Analyzer, and much of the literature that measures "vocal tone," analyzes the valence of the words spoken (i.e., lexical content). There are a number of software implementations that assess true vocal affect from the underling vocal chrematistics; yet, there are a number of concerns with such packages, primarily relating to validity. First, several highly-visible commercial options, such as Good Vibrations and Empath, lack data on their validity (classification accuracy). Second, the accuracy of classifiers varies greatly. Classifiers now commonly achieve accuracies markedly better than chance, and typical accuracies range from ~60% up to 83.5%; in contrast, naïve human raters achieve 60% accuracy while skilled human raters achieve 81.8% (Eskimez et al., 2016; Grimm et al., 2007; Satt et al., 2017). Like with humans, the most accurate models have been taught more ways to recognize stimuli and have more experience with classifying stimuli. Unfortunately, most work in this area was undertaken to develop computer learning methods, not to develop generally useful measures for other fields. Further, most research reports on classifiers omit the code/software. Those classifiers that make code available tend to have poor accuracy (e.g., 55%; Vogt et al., 2008). Continuing this theme of unavailability, some of the open-source classifiers that have drawn attention and been subject to prior research, notably

OpenEAR, have been plagued with licensing issues, resulting in their retraction from the market (e.g., Eyben et al., 2019). Unfortunately, there is no well-maintained, documented, high-validity open-source package for speech affect analysis currently. Third, while there are a number of commercial packages—such as Audeering, Call Minder, and Cogito—these are primarily tailored for specific uses such as call center evaluation. Thus, we sought software that met two key criteria: an algorithm that (a) completely aligned with our theoretical focus on valence and arousal, and (b) has been developed, tested, and validated in a broad set of use cases.

These criteria led us to select the Beyond Verbal Emotion AI API, a software service developed from interdisciplinary work in psychology and computer science to match the valence and arousal dimensions of affective responses theorized by psychologists (Lang, 1995). This algorithm was developed and validated with over 70,000 tagged voices with an accuracy of 80% as of 2014 (Mizroch, 2014). Since then, it has been further refined with an additional 2.5 million vocal samples (Beyond Verbal, 2013; Mack, 2017), and has been used in research (Garcia-Garcia et al., 2017; Maor et al., 2018). The database underlying the algorithm is language-invariant given the largely universal affective significance of vocal intonation (Elfenbein and Ambady, 2002; Johnstone and Scherer, 2000; Sauter and Scott, 2007). Validation tests of the Beyond Verbal Emotion AI API have found that that it shows "satisfactory results in a quiet environment" (Garcia-Garcia et al., 2017, p. 2) and can "properly identify emotions in dimensional terms" (i.e., valence and arousal) with good test-retest reliability (Pearson correlation coefficient = .977) (Arana et al., 2020, p. 7). We evaluated the reported classification accuracy in our own sample, coding the initial segments of the first 100 pitches in our data. Valence was coded as Negative, Neutral, or Positive and Arousal was coded as High, Medium, or Low. Reliability was strong (Valence $\alpha = .937$; Arousal $\alpha = .860$). As a check on classification accuracy differing between the beginning, middle, and end of pitches, we coded a further 200 pitch segments, split between middle and end of pitch videos. For middle segments, reliability

was again strong (Valence α = .962; Arousal α = .921), as was also the case for end segments (Valence α = .801; Arousal α = .875).[6]

Beyond Verbal measures affect in speech through the following procedure. First, the audio is isolated from each pitch video. Matching the range of human hearing, the audio spectrum between 20 Hz and 20 kHz was sampled every 10 milliseconds and 1,000 samples aggregated, resulting in 10-second audio segments, each of which was analyzed. This approach is necessary because affect is expressed and interpreted as pattern of changes over a period of time (Ball and Breese, 1999). Each 10-second segment overlaps its neighbors by five seconds. Having this five-second overlap is important as it provides context for each audio segment such that vocal characteristics are assessed in reference to preceding and following vocal utterances. The audio segments were analyzed to determine if speech was present; segments with less than 0.7 confidence (e.g., those containing music, multiple voices, or silence) were discarded. The 0.7 threshold was chosen to mirror the established threshold for adequate confidence in content analysis research (e.g., Krippendorff, 2004). Where the expressed vocal valence and vocal arousal values were predicted with 0.7 confidence or greater (e.g., Krippendorff, 2004), the segment was included in the pitch's vocal valence and vocal arousal values. These values were then standardized (z-score) to enable generation of the valence-arousal congruence measure.

5.2.3. Valence-arousal congruence

We drew from the significant body of organizational methods research in developing our congruence measure. Congruence is the absence of difference. "Euclidean distance (D-score) formulas have been widely used to operationalize" differences in organizational research (Riordan and Wayne, 2008, p. 566; e.g., Kilduff and Oh, 2006), including in content analysis research. The principal potential drawback of distance-type difference scores is they treat positive and negative differences the same (Riordan and Wayne, 2008). However, in the case of our study, this useful and necessary because our theory holds that the closer a valence-arousal

[6] Exemplars of pitch segments are available from the authors upon request.

combination is to the line y = -x (arousal = inverse of valence), the more congruent it is. This is because high arousal is congruent with negative valence and low arousal is congruent with positive valence (Robinson et al., 2004). In contrast, the farther a point defined by a valence-arousal combination is from the same line, the more in conflict it is. Incorporating this accepted congruence line (Nestler et al., 2019) with the standard formula for the distance from a point to a line (Ballantine and Jerbert, 1952), this simplifies to the formula $|Valence + Arousal|/\sqrt{2}$ since each coefficient other than valence and arousal has a value of 1. The output of this formula is a measure of conflict, as larger values equal increasing distance from the line of congruence. Thus, we reverse-code this value to yield the final congruence measure (the result of the formula is subtracted from the maximum value).

5.2.4. Perceived preparedness and perceived passion

Perceived preparedness and perceived passion were coded by three experts using the same scales as Study 1. These experts also coded control variables about the entrepreneur and the pitch (see next section). Following established procedures, we first developed specific coder procedures and conducted training prior to manual coding (Pollack et al., 2012; Scheaf et al., 2018). The first set of 50 funding pitches were each coded by two raters to establish initial interrater reliability as a check on the adequacy of the coding procedures and training (average Krippendorff's α = .88). Coders then met to discuss and reconcile discrepancies to achieve consensus. After that, the next 458 video-based funding pitches were split among the three coders. The final 50 funding pitches were each independently coded by two coders to check interrater reliability prior to reconciliation (average Krippendorff's α = .97). Scale reliability (average of coders) was acceptable for perceived passion (Li et al., 2017 scale; Cronbach's α = .98) and perceived preparedness (Chen et al., 2009 scale; Cronbach's α = .89).

5.3. Control variables

We controlled for alternative explanations identified in the literatures on entrepreneurial pitches and affective expressions. We began by developing a series of controls for platform and project-based characteristics. We employed year controls (2009–2016) and industry sector (15

categories) clustering for our robust standard errors given potential economic and sectoral differences (e.g., Allison et al., 2017). We controlled for number of campaigns per year on the platform within each category. We also controlled for campaign fundraising goal (US$), duration (days), and the length of the video-based funding pitch (minutes). We then developed a series of controls using computer-based analyses to account for other aspects of nonverbal communication (Bonaccio et al., 2016). First, as vocal characteristics have been found to be influential in persuasion in the broader literature on vocal expressions, we included vocal characteristics measured with Praat—a widely-used software package that analyzes objective acoustic characteristics (Boersma and Weenink, 2019): jitter (irregularities in duration), shimmer (irregularities in amplitude), the degree of silence, and frequency (Hz) average, standard deviation, minimum, and maximum. Second, we used the iMotions Emotient Facial Expression Analysis Engine (iMotions, 2018) to account for entrepreneurs' facial orientation (i.e., yaw, pitch, and roll) as a proxy for eye gaze (Slaney et al., 2014), and proximity (face size), as these reflect nonverbal aspects of communication (Bonaccio et al., 2016; Burgoon et al., 2016). We also controlled for the environment of each pitch, as receivers may be influenced by such qualities (Bitner, 1992). Using the FFmpeg image processing library, we measured pitch video brightness and color in the three primary colors of red, green, and blue. The presence of music (1 = music; 0 = no music) and the other controls, described below, were manually coded by three expert coders.

Broad characteristics of the entrepreneurial team were coded and controlled for: funding pitch team size (number involved), entrepreneur race/ethnicity (1 if there was a non-white team member in the pitch; 0 otherwise; see Anglin et al., 2018), gender (1 = man; 0 = woman), age (1: <18; 2: 18–24; 3: 25–44; 4: 45–64; 5: >=65), standing posture (1 = standing; 0 = sitting; see Hall, 1963), attractiveness (1 = very unattractive to 5 = very attractive; see Baron et al., 2006; Rule and Ambady, 2008), and expansiveness (1 = taking up very little space to 5 = taking up a lot of space; see Tiedens and Fragale, 2003). Where funding pitch videos included multiple individuals, we averaged ratings of their gender, age, posture, proximity, face orientation,

attractiveness, and expansiveness. Finally, we coded and controlled for characteristics of the funding pitch itself, including idea quality (1 = low to 5 = high; see Baron et al., 2006), stage of development (1 = prototype, demo, or sample; 0 otherwise), and product tangibility (1 = tangible; 0 otherwise; see Allison et al., 2017). Controls were included as covariates of all outcomes (both mediators and the funding DV), per accepted practice for path-based mediation.

5.4. Results

Descriptive statistics and correlations for Study 2 are shown in Table 7. Our path mediation models are reported in Table 8 and coefficients for paths are shown in Figure 5.

Table 7. Study 2 – Descriptive statistics

Variables		Mean	*SD*
1.	Funding (natural logarithm)	7.36	2.65
2.	Funding (US$)	12242.89	47530.72
3.	Number of campaigns (sector/year)	4562.98	3093.83
4.	Funding goal (US$)	16290.19	37505.91
5.	Fundraising duration (days)	32.56	10.78
6.	Pitch team size	1.79	1.80
7.	Stage of development	0.70	0.46
8.	Tangible vs. intangible	0.84	0.37
9.	Idea quality	2.77	0.85
10.	Race	0.15	0.35
11.	Gender	0.54	0.50
12.	Age	3.09	0.67
13.	Posture – standing	0.31	0.46
14.	Proximity – face size	14.58	11.59
15.	Face orientation – left to right yaw	-0.83	4.87
16.	Face orientation – head roll	0.22	2.61
17.	Face orientation – looking up vs. down	-0.79	4.39
18.	Attractiveness	2.94	0.79
19.	Expansiveness	3.06	0.65
20.	Length of pitch (minutes)	2.67	1.27
21.	Environment music	0.66	0.47
22.	Environment silence	1144.05	4175.04
23.	Environment color – red	114.32	62.79
24.	Environment color – green	101.00	59.77
25.	Environment color – blue	91.37	57.17
26.	Environment brightness	115.81	42.56
27.	Average frequency Hz	137.37	30.45
28.	Frequency *SD* Hz	44.86	13.93
29.	Minimum frequency Hz	46.51	3.69
30.	Maximum frequency Hz	304.27	18.11
31.	Jitter	0.03	0.01
32.	Shimmer	0.14	0.03
33.	Valence	0.00	1.00
34.	Arousal	0.00	1.00
35.	Valence-Arousal Congruence	3.38	0.77
36.	Perceived Passion	0.00	1.00
37.	Perceived Preparedness	0.00	1.00
38.	Perceived Passion * Perceived Preparedness	0.21	1.00

Notes: $N = 558$

Table 7 (Continued). Study 2 – Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
2.	.36																																				
3.	-.07	.10																																			
4.	.13	.40	.22																																		
5.	.04	.02	-.01	.13																																	
6.	.18	.03	.04	.11	.05																																
7.	.30	.12	-.02	.06	.05	.07																															
8.	.08	.07	.08	.02	.05	-.15	.14																														
9.	.23	.16	.22	.14	.05	.05	.12	.06																													
10.	-.06	-.04	.04	.05	.02	.55	-.01	-.10	.01																												
11.	-.20	-.13	-.01	-.08	-.01	-.16	-.09	.05	-.13	-.08																											
12.	.07	.06	.04	.06	.08	-.07	.07	.01	.01	-.13	.07																										
13.	.07	-.01	.00	-.06	.07	.04	.09	.00	.07	.04	.02	.02																									
14.	.00	.03	-.01	.14	.01	.20	.06	-.06	-.05	.08	-.01	.12	.09																								
15.	-.02	.03	.03	.03	.00	.00	-.06	.00	.00	.03	.02	.06	-.07	.04																							
16.	.09	.04	-.07	.04	.00	.03	.01	-.02	-.02	-.06	.06	.04	.07	.00	-.29																						
17.	.03	-.03	.01	-.10	-.03	-.03	.01	-.02	-.08	-.12	.07	-.10	-.05	-.05	-.10	.04																					
18.	.13	.02	.01	.00	-.05	.03	.10	.05	.26	.05	-.12	-.25	.07	-.06	-.01	-.05	.05																				
19.	.04	-.01	.02	.04	-.04	.00	.09	.08	.11	.01	.01	.04	.28	.04	-.05	.04	-.07	.24																			
20.	.12	.04	.04	.21	.06	.25	.16	-.05	.06	.04	-.01	.14	.00	.64	-.02	.03	.01	-.03	.06																		
21.	.25	.07	-.04	.06	.09	.12	.32	.02	.23	.02	-.08	.02	.07	.03	.01	-.01	.02	.17	.11	.15																	
22.	.00	-.02	.03	-.03	-.05	.08	.03	.04	.00	.00	.00	.04	.05	.09	.01	.05	.01	.00	-.01	.15	-.05																
23.	-.03	-.06	-.04	-.02	-.05	.04	.02	-.05	-.04	.03	-.06	-.06	-.04	-.02	-.07	.02	.08	.01	.01	-.04	.01	-.03															
24.	-.04	-.06	-.04	-.01	-.04	.04	-.02	-.05	-.06	.03	-.05	-.06	-.04	.01	-.07	.01	.08	.01	.02	-.01	.03	-.03	.89														
25.	-.05	-.05	.01	.06	-.02	.00	-.06	-.02	-.03	.01	-.07	-.04	-.04	-.01	-.08	.00	.06	.00	.04	-.01	.04	-.03	.76	.89													
26.	-.04	-.05	.07	-.01	-.06	-.02	.04	.09	.10	.02	-.05	-.08	.04	.01	-.06	-.01	.03	.04	.00	-.05	.01	-.04	.36	.42	.40												
27.	-.04	-.07	-.03	-.03	.00	.00	-.06	-.06	-.08	.03	-.36	-.06	.07	-.01	-.05	-.01	-.06	.08	.04	-.03	-.27	.02	.01	.00	.00	.04											
28.	.24	.08	-.04	.05	.00	.20	.21	-.03	.13	.08	-.42	-.02	.10	.05	-.09	-.01	-.09	.21	.15	.11	.39	.01	.01	.01	.04	.04	.38									
29.	-.16	-.04	.04	-.06	-.03	-.15	-.21	.01	-.09	.01	-.01	-.06	-.03	-.19	.08	-.02	-.01	-.01	-.05	-.30	-.36	-.03	-.04	-.06	-.06	-.05	.30	-.22							
30.	.14	.04	-.02	.07	-.06	.19	.12	-.03	.11	.04	-.28	.07	.02	.15	-.05	.01	-.07	.06	.08	.27	.11	.04	-.02	-.01	-.01	-.01	.41	.56	-.15							
31.	.15	.11	.01	.05	.02	.00	.15	.05	.08	-.04	.04	.04	.02	-.05	.00	.06	.04	.05	.03	-.01	.31	-.06	-.06	-.05	-.04	-.05	-.40	.20	-.26	-.01						
32.	.06	.04	-.12	.00	.00	.10	.08	-.01	.03	-.01	.11	-.01	-.03	-.05	-.02	.04	-.06	-.01	.03	-.02	.24	-.08	.03	.03	.02	-.12	-.31	.13	-.13	.01	.50					
33.	.13	.10	.08	.13	.09	-.03	.11	.05	.02	-.04	-.08	.06	-.01	-.05	-.13	.03	.04	-.04	-.03	-.05	.11	-.06	.05	.06	.10	.13	-.10	.07	-.06	-.02	.11	-.06				
34.	.03	.04	.09	.07	-.01	-.02	.01	-.03	.07	.00	-.07	-.04	-.01	-.02	.00	-.01	-.08	.06	.05	.01	-.04	-.05	-.03	-.03	-.02	.04	.27	.03	.13	.10	-.10	-.05	.18			
35.	.04	.02	.07	.03	.04	.01	.05	.03	.01	-.03	.00	.06	-.01	.01	-.05	.06	-.02	-.01	.04	.08	-.04	-.04	-.02	-.03	-.03	.00	.01	-.06	.03	-.03	-.03	.05	.28	.51		
36.	.22	.08	.04	.06	-.02	.07	.15	.03	.12	.04	-.14	-.02	.17	.05	-.04	-.01	-.01	.30	.36	.13	.18	.04	-.02	-.01	-.01	-.02	.22	.33	-.04	.24	.07	.05	.01	.31	.08	
37.	.26	.17	.30	.16	.03	.05	.20	.04	.62	.00	-.16	.06	.09	.06	.01	-.02	-.04	.21	.06	.21	.21	.10	-.09	-.09	-.06	.11	-.02	.13	-.14	.13	.07	-.07	.11	.19	.12	.21	
38.	.02	.05	.04	-.01	.07	-.03	-.01	-.02	.12	-.02	-.07	-.04	.09	-.06	-.01	.01	.00	.02	.05	-.01	-.05	.12	.01	-.01	-.03	.05	.07	-.02	.04	-.05	-.07	-.06	.02	-.05	.00	.03	.22

Notes: $N = 558$. Correlations with absolute value greater than 0.08 are significant at $p < .05$.

Table 8. Study 2 – Effect of vocal expression valence and arousal on funding via perceived passion and perceived preparedness

Variable	Var. → Funding		Var. → Perc Pass		Var. → Perc Prep		Indirect Effect			
									95% CI	
	Effect	SE	Effect	SE	Effect	SE	Effect	SE	LL	UL
Valence	0.15	0.14	-0.15	0.03			-0.05	0.02	-0.08	-0.01
Arousal	0.05	0.08	0.26	0.06			0.10	0.03	0.04	0.15
Valence-Arousal Congruence	-0.09	0.16			0.09	0.01	0.03	0.01	0.003	0.06
Perceived Passion (Mediator)	0.38	0.06								
Perceived Preparedness (Mediator)	0.36	0.18								
Perceived Passion * Perceived Preparedness	-0.02	0.07								
Number of campaigns (sector/year)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fundraising goal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fundraising duration	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pitch team size	0.32	0.06	-0.02	0.03	-0.02	0.01	-0.01	0.01	-0.04	0.01
Stage of development	1.12	0.33	0.03	0.07	0.15	0.12	0.06	0.05	-0.03	0.16
Tangible vs. intangible	0.35	0.31	0.03	0.08	-0.05	0.10	-0.01	0.06	-0.12	0.11
Idea quality	0.37	0.23	0.01	0.05	0.59	0.06	0.21	0.11	0.00	0.43
Race	-1.29	0.26	0.11	0.09	-0.01	0.10	0.04	0.05	-0.05	0.13
Gender	-0.65	0.29	-0.02	0.07	-0.14	0.06	-0.06	0.06	-0.18	0.07
Age	0.19	0.16	0.02	0.06	0.04	0.03	0.02	0.02	-0.02	0.07
Posture	0.11	0.25	0.14	0.11	0.14	0.06	0.10	0.07	-0.04	0.24
Proximity – face size	-0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00
Face orientation – left to right yaw	0.02	0.03	0.00	0.01	0.00	0.01	0.00	0.00	-0.01	0.01
Face orientation – head roll	0.09	0.04	-0.01	0.01	0.00	0.01	0.00	0.01	-0.01	0.01
Face orientation – looking up vs. down	0.02	0.02	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01
Attractiveness	0.09	0.16	0.20	0.04	0.08	0.03	0.11	0.03	0.05	0.16
Expansiveness	-0.32	0.20	0.37	0.04	-0.07	0.04	0.12	0.05	0.02	0.21
Length of pitch (minutes)	0.10	0.18	0.07	0.03	0.13	0.03	0.07	0.02	0.03	0.12
Environment music	0.01	0.25	0.10	0.06	0.12	0.07	0.08	0.04	0.00	0.16
Environment silence	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environment color – red	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environment color – green	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environment color – blue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Environment brightness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average frequency Hz	-0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Frequency *SD* Hz	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Minimum frequency Hz	0.00	0.03	0.01	0.01	-0.01	0.01	0.00	0.01	-0.01	0.01
Maximum frequency Hz	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jitter	6.55	23.89	6.12	5.23	8.63	9.71	5.37	4.42	-3.30	14.04
Shimmer	-3.55	2.04	1.63	1.23	-2.74	1.89	-0.36	1.17	-2.65	1.94

Notes: N = 558. Controls for year included but not reported for space; clustered robust standard errors by industry/product category.

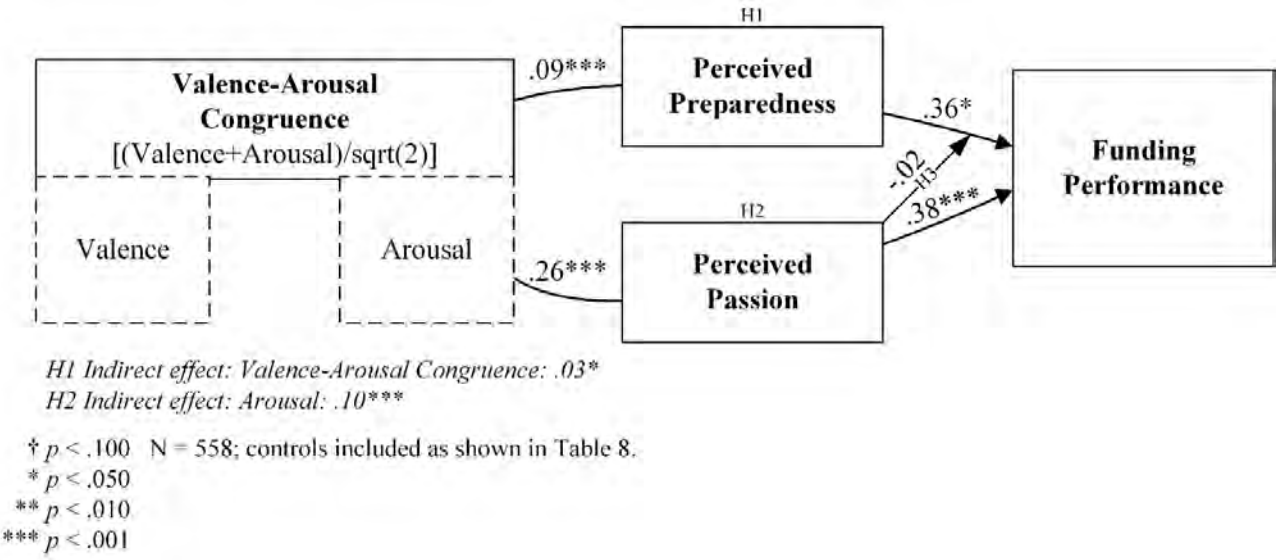


Figure 5. Study 2 – Results

Further supporting Hypothesis 1, in Study 2, valence-arousal congruence is a significant predictor of perceived preparedness ($B = 0.09$, $p < .001$), which in turn is a significant predictor of funding ($B = 0.36$, $p < .05$), and the indirect effect is significant with 95% confidence intervals not overlapping zero ($B = 0.03$; $CI = 0.003, 0.06$). Further supporting Hypothesis 2, arousal is a significant predictor of perceived passion ($B = 0.26$, $p < .001$), which in turn is a significant predictor of funding ($B = 0.38$, $p < .001$); the indirect effect is significant with 95% confidence intervals not overlapping zero ($B = 0.10$; $CI = 0.04, 0.15$). Finally, we examined the interaction effect of perceived passion and perceived preparedness (Hypothesis 3). In contrast to Study 1, our Study 2 results did not suggest a significant interaction ($B = -0.02$, $p = .735$).

5.4.1. Study 2 Robustness for alternative measure of congruence

Our results are the same in terms of sign and significance using alternative models and measures of congruence. Using the interaction of valence and arousal, ValenceXArousal is a significant predictor of perceived preparedness ($B = -0.05$, $p < .001$), which in turn is a significant predictor of funding ($B = 0.36$, $p < .05$), and the indirect effect is significant with 95% confidence intervals not overlapping zero ($B = -0.02$; $CI = -0.036, -0.001$). Note that the

sign of the coefficient estimates change using this interaction because in contrast to our main measure, larger values of this interaction variable indicate less congruence (i.e., conflict).

6. Discussion

We address the lack of theory and evidence concerning the influence of vocal expressions in entrepreneurial funding pitches. Our key contribution lies in isolating the influence of vocal expressions in shaping perceptions of passion and preparedness, and, through these perceptions, funding. Through two studies, one experimental (Study 1) and one applying speech affect analysis to an archival sample of funding pitches (Study 2), we found substantial support for our arguments. Consistent with our theorizing, vocal expressions characterized by valence-arousal congruence increased funding via perceived preparedness. Further, high-arousal vocal expressions—including those of positive and negative valence—increased funding via perceived passion. In Study 1, but not Study 2, we found evidence that perceived passion and perceived preparedness work together to promote funding intentions, which were highest to the extent that the entrepreneurs were perceived as both passionate and prepared.

Turning first to these findings, we found support for our contention that potential funders' cognitive processing effort, highest when valence and arousal conflict, take a toll on perceptions of the entrepreneur's preparedness. Given our finding that vocal expressions with conflicting valence and arousal lead to less favorable perceptions of preparedness, can entrepreneurs avoid this by remaining neutral, expressing little emotion in their voice? Our findings suggest not. Instead, we predicted and found that high-arousal expressions were important to engendering perceptions of passion. This suggests that entrepreneurs whose expressions have little intensity pay a different cost—they are perceived as less passionate.

Further, both negative and positive expressions of high arousal engender perceptions of passion, and both are present in funding pitches. Out of our sample of 558 real-world pitches, 58.6% included at least ten seconds of vocal expression characterized by negative valence. This is consistent with a recently published study on facial expression in pitches (Warnick et al., 2021), where 338 of the 489 pitches (69.1%) included at least one facial expression of anger,

which is a negative, high-arousal expression. Our findings that high-arousal expressions yield greater perceptions of passion and greater funding, regardless of whether they are of positive or negative valence, may initially be surprising, particularly given the widespread assumption that entrepreneurs are, or should be, positive in their pitches. Digging into our data reveals that this widespread assumption is *generally* correct; pitches are primarily positive in terms of the length of vocal expressions (87%). Yet, negative expressions are present at some point in a majority of the pitch videos in our sample, even though these short bursts of negative expressions are only a small proportion of the pitch length. Despite their limited presence in pitches, negative, high-arousal expressions matter. Our findings suggest that brief negative, high-arousal expressions may have an outsized influence on perceptions that the expressing entrepreneur is passionate, reflecting a disproportionate influence of negative expressions on attitudes and decision-making relative to those that are positive (cf. Baumeister et al., 2001).

While the passion an entrepreneur feels is an intense, positive feeling, we hypothesized and found that the perception of passion an observer attributes to an entrepreneur is driven by the arousal of entrepreneurs' vocal expressions—including those of positive valence and negative valence. In Study 2, our coefficient estimates suggested that not only is arousal positively related to perceptions of passion, but also that valence was negatively related to perceptions of passion. While we didn't need to find a negative relationship to support our hypothesis, this relationship merits discussion. First, why would negative, high-arousal expressions lead to perceptions of passion? In terms of entrepreneur behavior, this relationship can be understood to be "getting mad" in an entrepreneurial context, which implies that the object of the anger is likely some impediment that is salient to the entrepreneur (Warnick et al., 2021). Thus, entrepreneurs who express anger (or frustration) have an opportunity to demonstrate the extent to which they are passionate about the business, and perhaps are passionate about the opportunity to overcome whatever is causing that negatively valenced expression (e.g., anger or frustration). Second, while our study lends support to the idea that perceptions of passion form from negative, high-arousal expressions, it is also consistent with the idea that perceptions of passion form from

positive, high-arousal displays (as we theorized). There are vocal expressions in our data where the entrepreneur is positive and energetic and is perceived to be passionate. The fact that our overall coefficient for valence carried a negative sign may be yet another manifestation that "Bad is stronger than good" (e.g., Baumeister et al., 2001). In other words, the negative, high-arousal expressions get processed more thoroughly, resulting in valence, on average, having a negative effect on perceptions of passion. This underscores a running theme of our study, which is that our field needs to continue to explore negative expressions given the past emphasis on positive expressions (Baron et al., 2011, 2012). Third, while the preceding interpretation was supported by our own examination of pitches and by our experiment, we urge caution in interpreting the influence of valence or arousal in isolation from one another. Expressions convey both. Failing to consider this can lead to overlooking configurations of valence and arousal that are still perceived to be passionate.

We were surprised to find that Hypothesis 3—the interaction of perceived passion and preparedness on funding—was supported in Study 1 but not in Study 2. Our study takes the lead of Mitteness and colleagues (2012) that "What matters to funding is *perceived* passion" (p. 594, emphasis added). This is important, as measures of perceived and displayed passion differ in terms of what entrepreneurs do in their pitches (displayed passion) versus what observers believe about the entrepreneurs (perceived passion). One possible explanation for different results across our two studies highlights a long-running subtlety in the literature on passion and preparedness: Who perceives? To maximize ecological validity, participants in Study 1 rated their own perceptions of the passion and preparedness of the entrepreneurs they observed. This approach was not available for Study 2 since we employed archival data. Instead, three experts established coding procedures, ensured adequate agreement, and coded the campaigns using the same items from Study 1. Thus, a key difference between the two studies is that participants in Study 1 were observers within the decision environment who also went on to make resource allocation decisions, whereas the coders in Study 2 were separate from the population making such decisions. Such differences are common in the passion and preparedness studies we note in

Table 2. As a result, it may be that the interaction effect on funding outcomes depends on the person appraising the entrepreneur's passion and preparedness also having to make a choice about whether or not to provide any funds (and how much). Our findings suggest that, to the extent that the audience of a pitch perceives both passion and preparedness to be present—as is the case in Study 1—they will offer greater funding.

6.1. Contributions to theory and practice

The rising popularity of pitch videos, often held together by continuous voiceover, renders entrepreneurs' vocal expressions more important than ever. Our examination of vocal expressions complements research that has isolated other channels of expression in entrepreneurial pitches, including facial expressions (Jiang et al., 2019, Stroe et al., 2020; Warnick et al., 2021), bodily gestures (Clarke et al., 2019), and linguistic content (Allison et al., 2017; Balachandra et al., 2019; Chen et al., 2016; Parhankangas and Ehrlich, 2014; Ren et al., 2021). Conceptualizing and measuring these expression channels in terms of their valence and arousal not only allows for the integration of findings across otherwise disparate channels, but also yields important insights into the effects of affective congruence versus conflict across channels of expression in pitches (e.g., Guyer et al., 2018). We also connect with and build upon broader research on the role of voice in persuasion. Work in this area has often examined the voice's persuasive influence in terms of its acoustic profile, comprised of technical vocal characteristics like duration, shimmer, jitter, and frequency (Hz) (Burgoon et al., 1990; Van Zant and Berger, 2020). While not yet fully linking valence and arousal to persuasion, some work in this area shows that acoustic profiles can be used to discriminate between differing levels of valence and arousal, as judged by humans (e.g., Banse and Scherer, 1996).

Our archival study combined these two approaches, using machine learning to capture acoustic profiles during the pitch. Patterns of change in these profiles were extracted to discriminate between differing levels of valence and arousal. Although it has long been possible to examine how vocal expressions of affect influence persuasion in laboratory contexts, these approaches rely on acted, rehearsed, or otherwise non-naturalistic stimuli of relatively short

length (Russell et al., 2003). Our work suggests the potential of such approaches for naturalistic studies, while bridging theoretical conversations about affect and the social influence of vocal expressions (e.g., Clore and Schnall, 2005; Russell et al., 2003).

We also contribute to the literature on perceived passion and perceived preparedness by showing how specific aspects of entrepreneurs' vocal expressions influence these perceptions. This is important, as passion and preparedness are widely studied entrepreneurial characteristics in funding pitches. Conceptualization of passion as an intense positive feeling (Cardon et al., 2009) has led to the entrenched presumption that it is expressed through intense (i.e., high arousal) positive expressions, such as enthusiasm or excitement (e.g., Chen et al., 2009; Cardon et al., 2017; Davis et al., 2017; Shane et al., 2020). We challenge this by hypothesizing and demonstrating that perceptions of passion are also engendered by high-arousal vocal expressions that are negative, which carry a more serious, determined tone. We thereby complement Warnick and colleagues (2021), who found that entrepreneurs express passion not only via high-arousal positive facial expressions (e.g., happiness) but also through high-arousal negative facial expressions (e.g., anger) when discussing their determination and identification with their venture. Moving beyond the implicit presumption that passion is displayed and perceived by others solely through positive expressions, our work holds implications for research on passion and the types of expressions that are perceived by others as indicative of passion.

In contrast with research studying perceived passion as a function of affective expressions, perceived preparedness has generally been conceptualized as a function of pitch content (e.g., Cardon et al., 2017; Chen et al., 2009; Pollack et al., 2012). Challenging this view, we show that, beyond pitch content itself, the vocal expressions used in delivering pitch content are an important predictor of perceived preparedness. Specifically, we found that vocal expressions characterized by valence-arousal congruence (including high-arousal negative expressions and low-arousal positive expressions) increase perceived preparedness. Thus, our study makes clear that entrepreneurs' vocal expressions in a pitch impact not only perceptions of their passion, as highlighted in prior work, but also perceptions of their preparedness. Our

linking of vocal expressions to funding via perceptions of preparedness and passion integrates with entrepreneurship constructs of known importance, promoting theoretical parsimony, coherence, and depth in our understanding of pitches. Moreover, by theorizing perceived passion and perceived preparedness as mediators, we provide entrepreneurship-specific understanding relative to general theoretical frameworks connecting vocal expressions to social influence.

We also contribute understanding of the interplay between perceptions of passion and perceptions of preparedness. While this relationship has been informally investigated in the context of angel investment (Cardon et al., 2017), our measures and setting differ in meaningful ways, as noted above. We theorize and find that potential funders' perceptions of passion and preparedness interact such that funding is maximized when funders perceive an entrepreneur as both. Our theorizing and results suggest instances wherein perceived passion may undermine perceptions of perceived preparedness. For example, although high-arousal positive expressions engender perceptions of passion, such expressions are characterized by valence-arousal conflict, making them more difficult for funders to process, reducing perceived preparedness. In contrast, high-arousal negative expressions not only engender perceptions of passion by virtue of their arousal, but are also characterized by valence-arousal congruence, which promotes perceived preparedness as well. Given that research has often considered these two characteristics independently, rather than their interaction, our study sheds light on a possible explanation for why scholars have sometimes found an effect of perceived preparedness but not perceived passion (e.g., Chen et al., 2009). We further extend prior research that suggests the positive effects of perceived passion may depend on other factors, such as the entrepreneur's openness to feedback (Ho and Pollack, 2014; Warnick et al., 2018) or displayed commitment (Cardon et al., 2017).

We also extend beyond our field's frequent emphasis on positive expressions (Baron et al., 2011, 2012) by explaining how and why negative expressions may persuade funders to invest, and shed light on the role of arousal (i.e., activation) for both positive and negative expressions alike. While a focus on positive expressions fails to consider negative expressions, it

also fails to explicitly consider arousal—the second fundamental dimension of affect as established by the two-dimensional model (Russell and Barrett, 1999; Russell et al., 2003). Entrepreneurship scholars have acknowledged this gap in their calls for future research, noting that arousal is an important, yet understudied, dimension of affect (Foo et al., 2015; Huang et al., 2020). We take an initial step toward filling this gap by showing that the influence of positive and negative vocal expressions depends on their arousal, suggesting the need for joint consideration of both dimensions.

Finally, we also extend the scope of research on valence-arousal congruence, which has focused on static images (Eder and Rothermund, 2010; Robinson et al., 2004) and printed words (e.g., Citron et al., 2014a, 2014b, 2016; Wang et al., 2018). Our valence-arousal congruence framework holds promise for illuminating research on both verbal and nonverbal communication in other contexts such as management and leadership (e.g., Antonakis et al., 2016; Bono and Ilies, 2006). For example, in addition to the emphasis on clarity and comprehensibility in studies of perceived preparedness in entrepreneurial pitches (Chen et al., 2009; Pollack et al., 2012), work on perceptions of decision-makers' trustworthiness has likewise highlighted the need for communicating decisions in a way that is easy to understand (Maxwell and Levesque, 2014). This view is consistent with work highlighting that, when evaluating stimuli of varying valence and arousal, less cognitive load is favorable because exerting cognitive effort to control one's evaluations is associated with ambivalence and negative attitudes (Cunningham et al., 2004). Our findings regarding the congruence of valence and arousal parallels work on the influence of valence and arousal on the scope of cognitive processing, with high arousal and negative valence narrowing attention, and low arousal and positive valence broadening it (cf. Kahneman, 1973).

Practically, our findings suggest that entrepreneurs seeking funding should attend to both the positivity/negativity and activation of their voice when giving their pitch or other vocal presentations. For instance, when seeking to elicit the perception that they are passionate, they should consider using a highly activated (i.e., high-arousal) voice with either a positive or negative tone. Alternatively, when seeking to elicit the perception that they are prepared,

entrepreneurs should consider using a voice that is characterized by valence-arousal congruence (e.g., positive, low-arousal or negative, high-arousal). Both, however, are important for entrepreneurs seeking to obtain needed funds and, thus, should be equally considered. For instance, for a short pitch that must be quickly delivered, entrepreneurs might be wise to employ a voice reminiscent of a "fiery determination" (negative, high-arousal), as it is likely to enhance perceptions of preparedness and passion simultaneously, whereas speaking with "sad" (negative, low-arousal) vocal expressions likely detracts from perceived preparedness and passion due to valence-arousal conflict and low arousal. On a more general note, our study makes clear that entrepreneurs should consider not only *what* they say (in terms of pitch content) but also *how* they say it (in terms of vocal delivery) when attempting to persuade others.

6.2. Limitations and directions for future research

These contributions should be understood in light of our studies' limitations. First, we focus on the valence and arousal of entrepreneurs' vocal expressions rather than discrete emotions. While we chose this focus based on the established two-dimensional structure of affect (Clore and Schnall, 2005; Russell et al., 2003; Yik et al., 2011), further work is needed to integrate this affect-based approach with work on specific discrete emotions. For instance, both anger and fear involve negative valence and high arousal but differ in their motivational and behavioral effects (Lerner and Keltner, 2001; Russell, 2009). Our focus on the valence and arousal of vocal expressions naturally lent to examination of valence-arousal congruence. Although we measure and report the influence of valence-arousal congruence in linear fashion, such relationships may at times be curvilinear. For instance, very low arousal expressions may fail to garner attention whereas extremely high-arousal expressions may be too jarring, and thus deemed inappropriate and/or inauthentic (cf. Geddes and Callister, 2007; Shields, 2005; Warnick et al., 2021). We encourage future research to examine the potential for such curvilinear relationships in the context of entrepreneurship. We also recognize that there are other forms of congruence that future entrepreneurship research might examine, including congruence between one's affective state and that of the stimulus or message being processed, and congruence

between different stimuli or messages (Clore and Schnall, 2005; Ravaja and Kätsyri, 2014). In a similar vein, research using signaling theory proposes the persuasive benefits of congruent signals (Drover et al., 2018). Future research might integrate this with our theorizing to examine congruence within and between the various channels used to deliver a message, such as one's voice, facial expressions, bodily gestures, and the information communicated in pitch content.

Second, we designed our experiment to mirror the task environment of crowdfunding platforms. However, our focus on rewards-based crowdfunding may impose some limits on the generalizability of our findings. We urge future research to test our core assumptions regarding the influence of valence and arousal in other contexts, such as venture capital and angel investment. Building on this, we recognize that our choice to develop our experiment (Study 1) around a single actor delivering the same pitch raises some concerns of generalizability. Such concerns are addressed by Study 2, in which we test our full model using 558 crowdfunding pitches, with different entrepreneurs in each. It is also important to consider the dependent variable in our experimental design: funding intentions. Since measuring funds pledged by our participants in Study 1 was not feasible, we concluded that funding intentions was a reasonable choice based on prior support for intentions-based measures (Baron et al., 2006) and validation of such measures in the crowdfunding context (e.g., Allison et al., 2017; Wang and Yang, 2019). Moreover, we demonstrated convergent outcomes between the funds pledged and funding intentions measures for hypotheses one and two. Nevertheless, these different measures between Study 1 and Study 2 somewhat limit our ability to directly compare their findings.

Third, there may be differences in how people express affect and how they interpret the expressions of others. For instance, we focus on *perceived* passion but are unable to account for the passion actually felt by entrepreneurs. This is potentially important given that felt passion may not always align with its expression or perception (e.g., Lucas et al., 2016). Indeed, despite experiencing a given emotion or affective state, some people may not express it (Cardon, 2008) or may consciously attempt to modify their expressions as a means of impression management (Bansal and Clelland, 2004) or deception (Ekman and O'Sullivan, 1991). Future research should

explore such inauthenticity. Investors dislike perceived inauthenticity (e.g., Cardon et al., 2017), yet reports indicate that people are quite poor at detecting deceit (Ekman et al., 1999). As a result, investors may wrongly perceive authentic emotional expressions as inauthentic, or vice versa, with corresponding negative impacts on entrepreneurial resource acquisition.

Our focus on vocal expressions also carries some limitations. We encourage future research to consider the influence of other types of expressions alongside vocal expressions (e.g., the affect of words being spoken, or of facial expressions). Future research might also more explicitly consider which aspects of a pitch funders evaluate explicitly versus implicitly, as this may influence how valence and arousal are processed, shaping attitude formation (Cunningham et al., 2004). It may well be that many funders are not conscious of cues that affect their attitudes and behavior, or may disproportionately attend to certain cues to the relative neglect of others. Thus, our findings also suggest we study funders' judgments based on their affective experience—including emotional contagion (cf. Davis et al., 2017; Li et al., 2017)—and their affective reactions to entrepreneurs' expressions. This is particularly necessary for less-studied negative emotions (Baron et al., 2011, 2012). Our focus aligns with research on the development of cognitive perceptions, while acknowledging that expressions may also influence receivers via affective pathways. Although we do not formally theorize about this affective pathway, we explored this possibility in our post-hoc analysis (see section 4.4.4).

Fourth, another potential alternative model specification concerns the mediating mechanisms of passion and preparedness. We followed prior literature in suggesting that perceptions of passion and preparedness are formed and that these in turn influence investors (Chen et al., 2009). Our results were consistent with this specification. However, serial mediation wherein perceived passion predicts perceived preparedness offers an alternative model (cf. Singh et al,. 2016). Future research would be needed to assess whether such an alternative model has

more or less support than the model used in this study, given the limitations imposed by our methodological approaches.[7]

Fifth, much of the theory underlying our arguments is not only new to entrepreneurship but also relatively nascent in its development as it relates to the voice. This is particularly true for valence-arousal congruence, which has only recently been developed (e.g., Robinson et al., 2004) and had not been applied to the voice until now. As a result, it is important to acknowledge the existence of possible alternative explanations and encourage future research to tease out alternative relationships. For instance, given that some studies on valence-arousal congruence have used theories of motivation, such as by looking at approach and avoidance motivations (e.g., Citron et al., 2016), it might be fruitful to apply this same framework to the voice in the context of entrepreneurship. Doing so may provide a more robust understanding of how affective expressions influence receivers' behavior. Future research might also look to the broader literature on affect and emotion to further extend or enrich our model. Promising streams include mood maintenance theory and the appraisal tendency framework (Tiedens and Linton, 2001; Lerner and Keltner, 2001; Foo, 2011; Isen and Baron, 1991). Such work should continue to refine the field's knowledge of vocal affective expressions. In particular, we hope this work will shed further light and allow greater distinction to emerge between potential cognitive, affective, and motivational mechanisms that may shape the influence of entrepreneurs' vocal expressions.

Finally, our measure of vocal expressions is new to entrepreneurship research. While our use of a newer measure represented a reasonable trade-off, as it provided strong alignment with our theoretical framework of interest, readers should be aware of the inherent risks of measures that have not received extended scrutiny in the literature. Although our studies provide four types of evidence that collectively suggest our effect is robust and real (field data using a path model and a distance measure, field data using interaction coefficients to model congruence, rater

[7] With no controls or vocal expression antecedents, perceived passion has a significant indirect effect on funding through perceived preparedness (B = 0.13; CI = 0.06, 0.15), however the full model with our study controls and antecedents shows no significant indirect effect of perceived passion on funding via perceived preparedness (B = 0.04; CI = -0.01, 0.09). A controls-only (no antecedents) model is also not supported (B = 0.04; CI = -0.01, 0.09).

coding of field data, and a fully independent experiment), newer measures are inherently less certain compared to long-established ones. While coding-based measures also face threats to validity, these measures benefit from such threats being well known and understood. To that end, we encourage future research to establish discriminant validity between computer-based measures of vocal expressions and other similar concepts. Future research might also benefit from further validation of convergent validity using established scales and with other independent samples.

7. Conclusion

Pitches are a common, critical, vocally delivered means of resource acquisition for early-stage ventures. We demonstrate that how entrepreneurs speak in these pitches may influence their ability to raise capital from potential funders. Our theoretical development and empirical results provide a more complete and nuanced view of how specific aspects of vocal expressions, including their valence, arousal, and valence-arousal congruence, influence potential funders' perceptions of entrepreneurs' preparedness and passion which, in turn, positively influence funding.

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Appendix A.

Study 1 Pitch Transcript (Same Transcript Used for Each of the Four Vocal Conditions)

We had the idea for NetFree when travelling in Greece.

Essentially, the issue with most apps is that they require an internet connection. We wondered, could we reproduce the functions of the internet using only SMS? Not just one or two, but all that would be required by a traveler?

Our team designed the NetFree app to be superior. No internet required, no data roaming, just all in SMS – and all encrypted.

But we can do so much more.

Think of all the things that you can do via the web. Then picture doing them using NetFree—without the internet—and at a fraction of the cost.

We are seeking feedback as we tweak and validate the app.

Currently we only have the Android app, but we are vying to release the iPhone app as well.

Moreover, we plan to test NetFree on phone networks across the globe

Our overarching plan has begun to evolve into two parts.

First, we plan to deliver the internet to all of those who know how inconvenient and expensive the internet can be when it is not there.

Second, as NetFree grows, we plan to connect all of those people who do not have the internet.

It may not occur overnight, but if you help fund NetFree, we can essentially make spotty connections and data roaming history.

Appendix B.

To confirm the effectiveness of our experimental manipulation, we took two steps. First, three expert raters naïve to the experimental conditions independently listened to recorded audio of the actor's delivery of each of the four conditions in random order; there was full agreement ($\alpha = 1$), with each rater correctly identifying all four conditions. With the human coders confirming the manipulation succeeded, to cross-validate our measures across Studies 1 and 2, we additionally analyzed each of the four conditions using the speech affect analysis (SAA) algorithm used to measure valence and arousal in our Study 2 (field) data. Our SAA algorithm assesses vocal valence and arousal from verbal speech recordings (Beyond Verbal, 2021). To ensure adequate power and a reasonable number of experimental conditions, our experiment was a 2x2 design (two levels of valence, two levels of arousal). Accordingly, we used Beyond Verbal's categorical classification facility to examine whether the software would correctly categorize each of the four stimuli. Beyond Verbal classifies Valence as either Negative, Neutral, or Positive; Arousal also has three levels of classification: High, Medium, or Low.[8] For our Positive-High stimuli, Beyond Verbal returned classification values of Positive and High. For our Negative-High stimuli, Beyond Verbal returned classification values of Negative and High. For our Positive-Low stimuli, Beyond Verbal returned classification values of Positive and Low. For our Negative-Low stimuli, Beyond Verbal returned classification values of Negative and Low. Modeled confidence for all classifications was over our 70% cutoff. Classification accuracy was significantly better than chance (joint odds of four correct 9-category classifications = 0.015%), although this was expected given the high quality of the stimuli and our manipulation of each toward the extreme ends of both valence and arousal.

[8] Additionally, Valence and Arousal can each be Indeterminate, which signifies a failure to classify and thus low confidence in the classification of the audio.