Happy Applicants Achieve More: Expressed Positive Emotions Captured Using an AI Interview Predict Performances

Ji-eun Shin[1][†] · Hyeonju Lee[2]

Abstract

Do happy applicants achieve more? Although it is well established that happiness predicts desirable work-related outcomes, previous findings were primarily obtained in social settings. In this study, we extended the scope of the "happiness premium" effect to the artificial intelligence (AI) context. Specifically, we examined whether an applicant's happiness signal captured using an AI system effectively predicts his/her objective performance. Data from 3,609 job applicants showed that verbally expressed happiness (frequency of positive words) during an AI interview predicts cognitive task scores, and this tendency was more pronounced among women than men. However, facially expressed happiness (frequency of smiling) recorded using AI could not predict the performance. Thus, when AI is involved in a hiring process, verbal rather than the facial cues of happiness provide a more valid marker for applicants' hiring chances.

Key words: Happiness, Emotion, Facial Expression, Language, Artificial Intelligence

1. INTRODUCTION

Happiness is universally valued. One fundamental reason underlying this valuation is that happiness carries long-term benefits by building fitness-related resources (Fredrickson, 2013); happy individuals have better physical health, fertility, and social relationships than their unhappy counterparts (Diener, Kanazawa, Suh, & Oishi, 2015; Lim, Shin, Hong, & Suh, 2013). Furthermore, they are more likely to be productive and successful in the workplace (Walsh, Boehm, & Lyubomirsky, 2018). Past research on the 'happiness premium' at work has focused primarily on favorable outcomes of those currently employed (e.g., income, job satisfaction). In the present study, however, we pay attention to an essential first step of career success – getting hired. That is, would happy applicants perform better in a job interview?

Although happiness is an internal experience, it can be outwardly expressed and conveyed through multiple cues, particularly language use and facial expressions (Sun, Schwartz, Son, Kern, & Vazire, 2019). This expressed affective state predicts long-term life outcomes. In classic examples, nuns who used more positive words (e.g., joy, hope) in their autobiographies lived significantly longer (Danner, Snowdon, & Friesen, 2001), and people who smiled more intensely in photographs later reported greater relationship satisfaction (Hertenstein, Hansel, Butts, & Hile, 2009). The findings suggest the possibility that various signals of happiness contain information about the person's competence in various life domains, ranging from health to social relationships. Indeed, employers also utilize happiness

---

[1][†] (Corresponding author) Ji-eun Shin: Assistant professor, Department of psychology, Chonnam National University / E-mail: jieunshin@jnu.ac.kr / TEL: 062-530-2752

[2] Hyeonju Lee: Manager, Psychological solution planning part, MIDAS IT / E-mail: lhj0605@midasit.com / TEL: 031-789-2000

as a cue in hiring decisions. Applicants with more intense positive emotional expressions are more likely to be invited for follow-up interviews (Burger & Caldwell, 2000) and are more likely to be hired (Benchari et al., 2019).

By analyzing a large dataset of job applicants, this study aimed to replicate and expand past findings in several directions. First, existing research on happiness and its beneficial consequences was largely based on either verbal or nonverbal cues. As such, more work is needed to understand if happiness reflected in a person's language and face differentially relate to performance. We sought to address this issue by analyzing multiple happiness indicators (verbal and facial) simultaneously, and compared the relative contribution of the two. In the analysis, gender was considered as a potential modulating factor. Consistent with gender role theory and social-developmental theory (e.g., Chaplin, 2015), women display happiness more than men (LaFrance, Hecht, & Paluck, 2003) and its impact on perceived attractiveness seems also larger for women (Penton-Voak & Chang, 2008). Above findings suggest that happiness is valued more highly when displayed by women than men, which may lead to a gender gap in happiness benefits (Tsai et al., 2019). Although previous work relied mainly on evidence from social judgments (attractiveness rating), we predicted that women may also reap more benefits from happiness displays than men in a job interview.

A notable aspect of this study is that the verbal and facial displays of the interviewee's happiness took place during interactions with an artificial intelligence (AI) agent. Despite growing importance of the AI in work settings, its ability to detect the happiness-success link is still unclear. On the one hand, human quality is often imbued on AI; people are inclined to apply social norms and expectations to an AI agent (Nass & Moon, 2000). There also is evidence, however, that people react to AI differently, such that they tend to be less extraverted and self-disclosing when communicating with an AI than with humans (Mou & Xu, 2017). Analyzing an applicant's choice of words and facial expressions during an

AI-based interview may afford us a unique opportunity to address a new question. What happiness cue (s), during an AI interview, predicts job performance?

2. METHOD

2.1. Subjects

The present study used the data collected from 4,010 job candidates. Among the total, 401 were excluded because of invalid responses ($n = 340$) and missing values ($n = 61$). Our final analysis included 3,609 participants (men = 1,745, women = 1,864; $M_{age} = 26.95$).

2.2. Procedure

Applicants were led to log into the online interview site. After reading the informed consent, applicants registered their faces. The AI-based job interview consisted of three parts. At the beginning, applicants were presented with surveys assessing their personal attributes. Next, they were asked to perform a video interview, recording answers to preset questions about their thoughts and experiences in particular situations. Despite the uniformity of interview questions, the way in which answers were given may reflect individual differences in affective experiences. AI coded two indices of happiness: (a) the frequency of positive words and (b) the frequency of smiling. Finally, applicants were offered several game-based tasks intended to evaluate their cognitive competencies (e.g., executive function, memory). The task score was used as a proxy for job performance in predicting the applicants' suitability.

2.3. Measurement

2.3.1. Expressed happiness

Happiness was operationalized as the frequency of positive word and facial smiling displayed during the

interview. As for the verbally-expressed happiness, responses to four open-ended questions (e.g., please describe your job-relevant experiences) were combined. As seen in Table 1, the AI system coded the content (what is being said) and style (how it is being said) of words, and classified each word into positive, negative, and neutral emotion categories by using natural language processing algorithms. For the verbal happiness measure, we calculated the average percentage of positive emotion words used in answers. As for the facially-expressed happiness, the videos of each applicant were coded for smiling based on the recognition of specific sets of facial movements with the facial coding system (c.f., Ekman, Friesen, & Hager, 2002). We computed the percentage of smiling among all the encoded facial expressions.

Table 1. Examples of spoken words during AI video interview

Category	Subcategory	Examples
Positive	Noun	Pleasure, victory, meaning, happiness, vigor, resilience
	Verb	Love, win, devote, believe, achieve, thrive, overcome
	Adjective	Worthwhile, faithful, excellent, meaningful, wise
Negative	Noun	Worry, unhappiness, pain, mistake, conflict, fear,
	Verb	Give up, blame, deceive, destroy, regret, cry, avoid
	Adjective	Anxious, irresponsible, painful, futile, helpless

2.3.2. Facial attractiveness

Because happy-looking faces appeared more attractive (O'Doherty, Winston, & Critchley, 2003), three coders ($M = 3.22$, $SD = 0.93$; ICC = 0.84) independently rated the attractiveness of the facial image on a 7-point scale (1 = very unattractive, 7 = very attractive).

2.3.3. Task performance

The AI system analyzed applicants' responses to a number of cognitive tasks that were intended to assess job-relevant competence. The first task was the n-back task (Owen, McMillan, Laird, & Bullmore, 2005) that measures working memory capacity. Accuracy ($M = 46.52$, $SD = 14.31$) on this task was calculated as the percentage of hit rate. The Figure Weights task, included in the Wechsler Adult Intelligent Scale (WAIS-IV; Wechsler, 2008) was also measured. It requires quantitative reasoning skills for selecting the appropriate missing weights needed to balance a scale. Again, accuracy ($M = 51.01$, $SD = 10.60$) was calculated as the percentage of trials answered correctly. Third is the Stroop task (Stroop, 1935), one of the most widely used measure of selective attention and inhibitory control, was administered. In this task, participants are required to identify the color of words mismatched with the name of the color (e.g., the word GREEN presented in blue color) as quickly as possible. The delay in reaction times between congruent and incongruent conditions was calculated (and converted into score out of 100) and used as a Stroop performance measure ($M = 49.92$, $SD = 11.30$). Three task scores were averaged (α = .56) to form an index of job performance ($M = 49.15$, $SD = 8.87$), and a greater value indicates higher achievement.

3. RESULTS

We first computed the mean frequency of verbal and facial happiness expressions for each target. As seen in Table 2, people had a general tendency to use more pos-

Table 2. Descriptive statistics of key variables

Variable	Men	Women	Total
	M (SD)	*M (SD)*	*M (SD)*
Verbal			
Positive word	24.99 (2.03)	25.63 (2.00)	25.32 (2.01)
Negative word	11.68 (1.13)	11.69 (1.12)	11.69 (1.14)
Total amount of words	358.90 (91.99)	351.67 (93.40)	355.65 (92.68)
Nonverbal			
Percentage of smiling	60.28 (17.90)	71.89 (18.17)	66.27 (18.95)
Total duration (ms)	461.58 (90.40)	449.70 (93.41)	456.25 (91.95)

Note. Standard deviations are given in parentheses.

itive (M = 25.32, SD = 2.01) than negative (M = 11.69, SD = 1.14) emotion words, F(1, 3608) = 104007.44, p < .001, η_p^2 = .966. As predicted, this positivity bias in language (c.f., Dodds et al., 2015) varied by gender, F(1, 3607) = 57.707, p < .001, η_p^2 = .016; women used a higher percentage of positive (vs. negative) words than men in their interviews. A similar pattern was found regarding facial expressions; women (M = 71.89, SD = 18.17) exhibited more smiling than men (M = 60.28, SD = 17.90), t(3607) = -19.31, p < .001, η_p^2 = .094.

We next conducted hierarchical regression analysis, adding two measures of happiness simultaneously, to examine which type of happiness relates more strongly to performance. After controlling for demographics (gender, age), verbally-expressed happiness significantly predicted cognitive ability (b = 0.36, SE = 0.07, β = 0.09, p < .001), whereas facially-expressed happiness did not (b = 0.96, SE = 0.73, β = 0.02, p = .185). We replicated this analysis with an additional covariate (perceived facial attractiveness) and found an identical pattern of results. Overall, verbal (vs. nonverbal) display of happiness seemed more strongly tied to the objective performance, such that applicants who mentioned more positive words were likely to obtain higher scores on the current set of cognitive tasks.

Finally, we examined whether the happiness-performance association is varied as a function of gender. The moderation analysis using the PROCESS macro (Model 1, with 5,000 bootstrap samples; Hayes, 2013) revealed that verbally-expressed happiness was more strongly related to performance among women than men, b = 0.34, SE = 0.15, p = .021, CI_{95} = [0.051, 0.619]. That is, verbally-expressed happiness related to task scores in men, b = 0.26, SE = 0.10, p = .011, CI_{95} = [0.060, 0.468], but this relationship was stronger in women, b = 0.60, SE = 0.10, p < .001, CI_{95} = [0.400, 0.799]. The moderation remained significant even after controlling for other covariates (e.g., age, facial happiness, total amount of word use), b = 0.35, SE = 0.14, p = .015, CI_{95} = [0.068, 0.632].

4. DISCUSSION

Do happy applicants achieve more? Despite much research into the benefits of happiness on productivity, questions still remained whether the phenomenon, based primarily on human interactions, can further be applied to the context of AI. By analyzing emotion displays during an AI-based interview, we found that happy applicants scored higher on cognitive tasks than their less happy counterparts. Given that AI has become integrated into people's social lives, this work opens up avenues for future research on a new, timely boundary condition.

This study expands our understanding of happiness. First, most of existing work documenting the happiness premium effect at work were obtained through human evaluations. Instead of other- (e.g., supervisor) or self-rated productivity (e.g., "How productive were you in your work role?"), we found parallel patterns through AI-based data. One interesting aspect of this finding was that gender modulated this beneficiary effect of happiness, in the direction congruent with gender-specific cultural norms (Chaplin, 2015). A more nuanced understanding of the benefits of happiness seem to require an inclusion of gender consideration.

Most interestingly, the happiness-success relation was observed only via the verbal component of happiness. Given that facial expressions play a prominent role in emotional communication, our findings at first glance may seem confusing. Although this study does not shed direct light on why smiling was not predictive of performance, previous research on self-presentation (e.g., Sandal et al., 2014) can give a hint. That is, facial smiling might be uniformly tailored in an employment setting, in which people are consciously trying to present themselves in the most favorable light. Our findings provide preliminary evidence that verbal and nonverbal display of happiness captured by an AI agent may carry distinctive information in an employment setting. When AI agents are involved in a hiring process, applicants' expressed verbal happiness (more so than facial ex-

pression) can serve as a marker for his/her performance on job-relevant tasks.

REFERENCES

Bencharit, L. Z., Ho, Y. W., Fung, H. H., Yeung, D. Y., Stephens, N. M., Romero-Canyas, R., & Tsai, J. L. (2019). Should job applicants be excited or calm? The role of culture and ideal affect in employment settings. *Emotion, 19*, 377-401. DOI: 10.1037/emo0000444

Burger, J. M., & Caldwell, D. F. (2000). Personality, social activities, job-search behavior and interview success: Distinguishing between PANAS trait positive affect and NEO extraversion. *Motivation and Emotion, 24,* 51-62. DOI: 10.1023/A:1005539609679

Chaplin, T. M. (2015). Gender and emotion expression: A developmental contextual perspective. *Emotion Review, 7,* 14-21. DOI: 10.1177/1754073914544408

Danner, D. D., Snowdon, D. A., & Friesen, W. V. (2001). Positive emotions in early life and longevity: Findings from the nun study. *Journal of Personality and Social Psychology, 80,* 804-813. DOI: 10.1037/0022-3514.80.5.804

Diener, E., Kanazawa, S., Suh, E. M., & Oishi, S. (2015). Why people are in a generally good mood. *Personality and Social Psychology Review, 19,* 235-256. DOI: 10.1177/1088868314544467

Diener, E., Sandvik, E., & Pavot, W. (2009). Happiness is the frequency, not the intensity, of positive versus negative affect. In E. Diener (Ed.), *Assessing well- being: The collected works of Ed Diener* (Vol. 39). Netherlands: Springer. DOI: 10.1007/978-90-481-2354-4_10

Ekman, P., Friesen, W., & Hager, J. (2002). *Facial action coding system.* Salt Lake City: Research Nexus eBook. https://doi.org/10.1037/t27734-000

Fredrickson, B. L. (2013). Positive emotions broaden and build. In E. A. Plant & P. G. Devine (Eds.), *Advances in experimental social psychology* (Vol. 47). San Diego, CA: Academic Press. DOI: 10.1016/b978-0-12-407236-7.00001-2

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach.* New York, NY: Guilford Press. DOI: 10.1111/jedm.12050

Hertenstein, M. J., Hansel, C. A., Butts, A. M., & Hile, S. N. (2009). Smile intensity in photographs predicts divorce later in life. *Motivation and Emotion, 33,* 99-105. DOI: 10.1007/s11031-009-9124-6

LaFrance, M., Hecht, M. A., & Paluck, E. L. (2003). The contingent smile: A meta-analysis of sex differences in smiling. *Psychological Bulletin, 129,* 305-334. DOI: 10.1037/0033-2909.129.2.305

Lim, N., Shin, J. E., Hong, S., & Suh, E. M. (2013). 'Joy' promotes supportive reactions in social interactions. *Science of Emotion and Sensibility, 16,* 221-234.

Mou, Y. & Xu, K. (2017). The media inequality: Comparing the initial human-human and human-AI social interactions. *Computers in Human Behavior, 72,* 432-440. DOI: 10.1016/j.chb.2017.02.067

Nass, C., & Moon, Y. (2000). Machines and mindlessness: Social responses to computers. *Journal of Social Issues, 56,* 81-103. DOI: 10.1111/0022-4537.00153

O'Doherty, J., Winston, J., Critchley, H., Perrett, D., Burt, D. M., & Dolan, R. J. (2003). Beauty in a smile: The role of medial orbitofrontal cortex in facial attractiveness. *Neuropsychologia, 41,* 147-155. DOI: 10.1016/s0028-3932(02)00145-8

Owen, A. M., McMillan, K. M., Laird, A. R., & Bullmore, E. (2005). N-back working memory paradigm: A meta-analysis of normative functional neuroimaging studies. *Human Brain Mapping, 25,* 46-59. DOI: 10.1002/hbm.20131

Penton-Voak, I. S., & Chang, H. Y. (2008). Attractiveness judgments of individuals vary across emotional expression and movement conditions. *Journal of Evolutionary Psychology, 6,* 89-100. DOI: 10.1556/jep.2008.1011

Sandal, G. M., van de Vijver, F., Bye, H. H., Sam, D. L., Amponsah, B., Cakar, N., Franke, G. H., Ismail, R., Kjellsen, K., Kosic, A., Leontieva, A., Mortazavi, S., & Tien-Lun Sun, C. (2014). Intended self-presentation

tactics in job interviews: A 10-country study. *Journal of Cross- Cultural Psychology*, *45*, 939-958. DOI: 10.1177/0022022114532353

Stroop, J. R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18,* 643-662. DOI: 10.1037/h0054651

Sun, J., Schwartz, H. A., Son, Y., Kern, M. L., & Vazire, S. (2019). The language of well-being: Tracking fluctuations in emotion experience through everyday speech. *Journal of Personality and Social Psychology, 118,* 364-387. DOI: 10.31234/osf.io/8fpjn

Tsai, J. L., Blevins, E., Bencharit, L. Z., Chim, L., Fung, H. H., & Yeung, D. Y. (2019). Cultural variation in social judgments of smiles: The role of ideal affect. *Journal of Personality and Social Psychology, 116,* 966-988. DOI: 10.1037/pspp0000192

Walsh, L. C., Boehm, J. K., & Lyubomirsky, S. (2018). Does happiness promote career success? Revisiting the evidence. *Journal of Career Assessment,* 26, 199-219. DOI: 10.1177/1069072717751441