FACIAL WIDTH-TO-HEIGHT RATIO (fWHR) AND JUDGMENTS OF CREATIVITY

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by
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ABSTRACT

A great deal of research has investigated how to effectively stimulate creative problem solving, but much less is known about how people evaluate creative ideas posed by others. This project seeks to investigate one factor that might impact how people evaluate ideas: facial width-to-height ratio (fWHR). Extant research suggests that the sexually dimorphic measure of fWHR is associated with negative traits such as aggression, unethical behavior, untrustworthiness, and dominance. It is currently unclear whether this facial trait relates to judgments of a positive attribute such as creativity.

The purpose of this study was to investigate the role that fWHR plays in judgments of innovative ideas. We hypothesized that individuals will perceive someone with a high facial width-to-height ratio, measured by facial width divided by height, as more creative than someone with a low facial width-to-height ratio. Furthermore, an idea pitched by someone with a high facial width-to-height ratio will be perceived as more creative than the same idea pitched by someone with a low facial width-to-height ratio.

Four surveys were generated and distributed at random. Each survey included a different image of a white male ("Steve") with brown hair, with varying fWHR (low vs. high). Each participant completed a set of Likert questionnaires that first assessed Steve's personality traits based on appearance, and then evaluated the novel idea presented by Steve to assess product novelty and potential success.

437 individuals responded to the survey, and 435 of these respondents were included in final analyses. Two participants were dropped due to incomplete responses.

From this data, we expected the fWHR, as opposed to the overall image of a face, to be the driving force behind how respondents evaluate one's personality traits and the novelty and success of the product he designed.

The first one-way ANOVA revealed that there were significant mean differences in creativity by Steve image ($p<0.05$), but not by fWHR. Results regarding the novelty and success of Steve's product suggested that the level of marketability, worthiness of making and usefulness might be dependent on facial characteristics as well.

In sum, we present evidence suggesting that the perception of creativity does differ by a person's appearance, but not by fWHR. Future studies should be done to investigate why individuals are more sensitive to facial appearance, as opposed to facial width-to-height ratio, in judgments of creativity.

BIOGRAPHICAL SKETCH

Hannah Kremer is a 2015 graduate of the ILR School at Cornell University, where she majored in Industrial and Labor Relations and minored in Communication. She is a candidate for her Master of Science degree in Industrial and Labor Relations at Cornell University, focusing in Organizational Behavior. Hannah plans to apply her research in the corporate world while she considers further pursuing her studies with a doctorate.

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Facial Width-To-Height Ratio (fWHR) and Creativity:

In today's vernacular, "creativity" is often assumed to refer to artistic creativity. A person is perceived as creative if he or she has painted a beautiful painting, taken an exceptional picture, or written a unique story. Humans judge other people based on the impression given; if a person is dressed in a unique manner, society infers that he or she is a creative person. Is it possible that judgments of creativity indeed go beyond the pigeonhole of stereotyping?

Creativity is much more than just an artistic gift. Creativity has been defined as the generation of novel and useful ideas or solutions to problems [1, 2, 3], novelty being the key distinguishing feature of creativity beyond ideas that are merely well presented[4]. Specifically, a person is creative when he or she has come up with something that both has not been seen before and has a real application. The very purpose of any innovative idea is itself a key part in determining whether it is a creative development, and further, in determining that development's relative value. A great deal of research has investigated how to effectively stimulate creative problem solving, but much less is known about how people evaluate the creative ideas suggested by others. In this project, we investigate one factor that might impact how people evaluate ideas: facial width-to-height ratio (fWHR).

It is established that a higher facial width-to-height ratio correlates with internal testosterone levels[5]. Furthermore, current research reveals that higher level of testosterone has been shown to correlate with characteristics such as aggression, untrustworthiness, unethical behavior, and dominance. People with high social status tend to be more creative, and other research shows that successful individuals such as male CEOs, athletes, and United States presidents[6] have a high fWHR. Given that these men are inherently of a high social status, one

might predict that, accordingly, people with a higher facial width-to-height ratio will be perceived by others to be creative.

Prior work reveals that there is an established prototype of creative individuals. People have a certain expectation of what creative individuals are likely to be, and if someone fits that profile, absent any other factors, then observers will adhere to that assumption. Someone who appears to be dominant because of traits that are associated with dominance is also likely to be considered creative because their confidence is mistaken for a trait that creative people possess. Goncalo et al.'s 2010 study reveals that while narcissists may not be creative, their high levels of self-confidence influence the way that others evaluate their ideas[7]. Since narcissistic individuals are highly skilled at persuading others to agree with them, they are more likely to be judged as creative. As a result, this dominant behavior has evolved to become a stereotype of highly creative people. Such manipulation by self-absorbed and dominant individuals might be a cue that someone is creative and could lead to the evaluation of dominant individuals' ideas as being highly innovative.

Personal factors also have an effect on one's creativity, including but not limited to personality and experiential factors. While a range of character traits influences how an individual develops creativity, those traits potentially linked to fWHR – aggression and dominance – are of particular importance for expressing innovative ideas. The association between fWHR and aggressive behavior, while ostensibly related to testosterone levels[8], could illustrate a relationship between fWHR and creativity. Extremely creative people are frequently outspoken, sharing their inventiveness with the world. This is oftentimes shown by an intense attraction to dramatic behaviors. It is unlikely that docile individuals lacking aggressive personality traits would demonstrate such creative expressions. Furthermore, existing research on

what allows an individual to develop creativity suggests that much can be attributed to personal status[9]. Individuals with extremely high or low status are most likely to be creative, since both classes believe they have little to lose. The opportunity for self-expression found in generating creative ideas allows for open expression without foreseen consequence. Frequently, those who identify themselves as high status individuals are those in an elite group, such as political leaders. When studying fWHR and former US presidents, Lewis et al. found a positive association between fWHR and achievement drive. This level of perceived dominance may also be associated with creative individuals who tend to desire autonomy, preferring developments based on personal achievements rather than outside influence[10]. Accordingly, it follows that creativity may also be associated with fWHR, as well as dominance and aggression.

Research has shown that experiential factors such as social status is related to creativity, with three main echelons of people discussed. Duguid and Goncalo's 2015 study emphasizes that people in the middle status group are more concerned about the risk of damaging their own reputations in front of those they are trying to impress – those in the higher status group. The highest status level has more clout than the other two groups, since these members are more respected because they have attained a higher financial or educational level. This might be easily interpreted to mean that high-status individuals are opinionated and rarely admonished by others, partly because they have access to deeper resources. Privileges associated with high status individuals allow them to remove evaluation anxiety and encourage the flow of creative ideas. Since these individuals are financially and socially secure, they do not fear the repercussions of failure that can lead to loss of livelihood or wellbeing[10]. On the opposite end, individuals who focus on maintaining the status quo are less likely to be creative. Since they are overly concerned with what others think of them, they avoid criticism at all cost. A fear of status loss drives them

to stifle creativity. For individuals in this group, creative solutions are novel and therefore likely to encounter resistance, criticism and conflict. Whereas middle and low status individuals tend to conform, stifling their creativity, high status individuals welcome criticism and evaluation of their ideas. Both power and status converge to make people adept at being creative[10]. This creativity can be manifested in the high self-esteem and ego satisfaction of those with high status.

Is it possible that novel research could allow investigators to go beyond personal and personality factors to unearth physical attributes that indicate creativity? Do variables exist that are out of our control? Current research suggests that facial width-to-height ratio (fWHR) has been associated with aggression, unethical behavior, untrustworthiness, and dominance; it is currently unclear whether this facial trait relates to creativity or ideation. We attempt to address this question by investigating the role that fWHR plays in judgments of original ideas. As fWHR reveals associations of behavior to individuals in the "highest echelons of power[6]," certain personality traits linked to extremely successful people are similarly seen in those who are highly creative. In line with previous work showing links from fWHR to aggression and dominance, we hypothesize that fWHR would positively predict the judgments of perceived creativity.

Individuals often have to share their ideas with others, and their appearance might affect how others evaluate the creativity of their ideas. In this project, we investigate fWHR as one aspect of personal appearance that might impact creativity judgments. Existing research suggests that individuals with greater fWHRs are perceived to be more dominant and assertive, impressions that are congruent with stereotypes of highly creative people. Thus, we predict that an idea will be viewed as more creative when presented by someone with a high fWHR when compared to the same idea posed by someone with a low fWHR.

Facial Width-To-Height Ratio (fWHR) Connotations:

A growing stream of research investigates facial width-to-height ratio (Figure 1) as an identified facial measure with links to a wide range of behavioral characteristics in men. Perhaps due to testosterone levels, fWHR is a sexually dimorphic[5] measure that is connected to traits such as aggression, unethical behavior, untrustworthiness, and a greater sense of power in men. Recently, researchers have examined the ratio of facial width to upper-facial height (specifically, the distance between upper lip and eyelid) as a possible physical marker of dominance that becomes larger in men after pubertal testosterone exposure[11]. Lefevre et al. focus on how facial width, combined with hormonal levels, impacts behavioral actions in men. Specifically, this study considered the ways in which various men were more or less successful when being judged in a speed-dating format. The physical measurements, such as the distance between a man's eyes, jawbone, and other features were recorded with great accuracy. During the speed dating session, the men stayed at their respective assigned tables while the women moved from table to table. Those men who were selected for dates more often had certain physical attributes that were clearly measured. The reason that men were studied and women were not is due to specific hormone levels that differ between women and men. It has been asserted that women with more "facial fat" have greater amounts of estrogen[12, 13]. This study by Lefevre explains why fWHR is sexually dimorphic and why only men are used in fWHR experiments. Since fWHR is linked to men's reactive testosterone levels, the measure can be used to predict highly unfavorable traits that can better explain behavioral tendencies and how to manipulate or avoid them.

Figure 1.

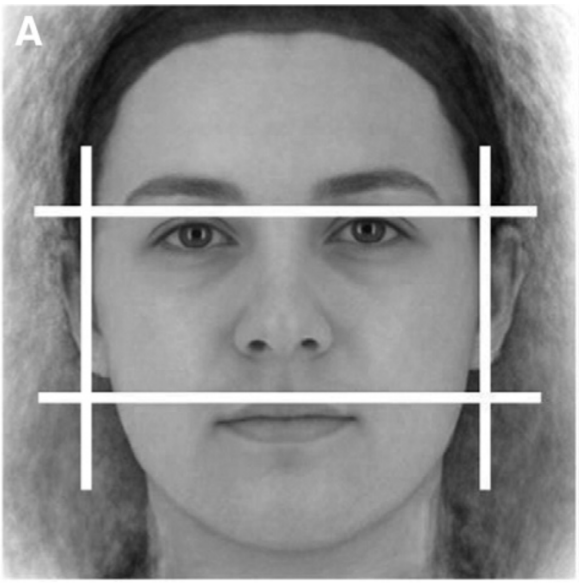


Figure 1. Image A illustrates the measure of fWHR. Horizontal lines represent upper face height, the distance between the upper lip and highest point of the eyelids, while vertical lines represent bizygomatic width, the maximum distance between the left and right facial boundary. fWHR is calculated as width divided by height, which we followed in this study. This figure is taken from Lefevre et al.'s 2013 study.

Men with high levels of testosterone have certain facial characteristics, such as high fWHR, that distinguish them from men with less testosterone. Carré and McCormick conducted three studies to assess the extent to which fWHR was associated with dominance and aggression in a behavioral task as well as in a natural setting. Studies two and three focused on whether the relationship between individual differences in the facial width-to-height ratio would predict aggressive behavior outside of a laboratory setting. The association between facial width-to-height ratio and aggressive behavior, defined as the number of penalty minutes obtained per game, was tested in male varsity hockey players and in the National Hockey League in studies two and three respectively. Research reveals that in both varsity and professional ice hockey games, players with higher fWHR are more likely to be penalized during the game. This can be attributed to the self-interested, aggressive behavior of those with high fWHR. Since fWHR is a

predictor of aggressive behavior, others might be socialized to treat men with higher fWHR differently, and these social cues shape their interactions over time[14].

Other research attempts to assess the physical traits that can predict unfavorable behavior in men by investigating their usual performance in relation to unethical behavior. For example, Haselhuhn and Wong used fWHR to evaluate men's performance and business integrity. This research is groundbreaking in that, for the first time, persistent physical traits can be used to predict unethical actions. fWHR allows people to use their visual power to estimate the likelihood of undesirable societal behaviors. Results show that men with higher facial width-to-height ratios have a greater tendency to behave more selfishly and cheat others in order to achieve a desired outcome. The authors proffer that this is due to men's feelings of power. A higher fWHR man feels more "powerful" than one with lower fWHR, so he takes action accordingly[15]. Therefore, a man who feels dominant over others might believe that he does not have to follow the generally accepted rules of society and might then behave improperly.

While a range of character traits likely influence attitudes, those linked to fWHR are of particular importance for organizational decision making. As an example, Gomulya et al.'s study begins with the well-known idea that during the 1960 Presidential debate between John F. Kennedy and Richard Nixon, if one were to close one's eyes and listen, Nixon would have won the debate. On the other hand, if one watched the debate and saw each man speak, JFK was the clear winner. So, is it true that the power of looks is more important than the actual information that is being delivered? This article also investigates case studies of two companies that fell to ruin because of the misguided judgments of their CEO's. In the case of Enron, the CEO lied to stakeholders about the condition that the business was in, knowing that many people trusted him and his authority. The stock went to zero and many workers lost their jobs and their life savings.

Similarly, another company, WorldCom, had a CEO that exercised poor judgment and used the company's resources to throw lavish parties and buy expensive artwork. Both CEOs in power had high fWHR, which likely related to the assertiveness that made them so successful. As a result of the assertiveness that comes with being a well-received confident person, both of these companies lost tremendous financial value for employees as well as shareholders. Facial width-to-height ratio was an important factor in both cases since fWHR was lower in the successor CEO's. The researchers found that the result of these experiences was that higher fWHR in men suggested that the man will be not trustworthy, and after financial collapse, the next CEO appointed will have a lower fWHR. While those with dominant conduct are likely to acquire powerful roles, negative impressions are more salient and easier to determine after tumultuous actions[16].

In a meta-analysis[8], researchers compiled data to evaluate the question of whether a man's fWHR is a compelling parallel to trustworthiness and interpersonal relationships. The research assessed that the "increased testosterone exposure" during puberty weighed heavily in an adult man's tendency to have a stronger affinity between his fWHR and his physical amount of testosterone. This led to a heavy reliance on facial characteristics as a judgment, revealing that if one man's fWHR were greater than that of another man's, then the man with the greater fWHR would be treated with more reverence. The respect might be due to the man with a higher fWHR assuming the role of a bully, but both types of men learn these behavioral patterns. Therefore, society develops a pattern in which the man with the higher fWHR is perceived as deserving to get his way over the man with the lower fWHR. These results align with previous data relating to aggressive behavior associated with fWHR, in that a strong connection between fWHR and a sense of power in men exists.

The expectation states theory explains how hierarchies are formed in small group interactions based on status cues[17]. One implication of this theoretical perspective is that a perception formed based on facial characteristics is not only physical but could eventually constitute a social category, like gender, with repeated interaction. Related work indicates that fWHR impacts behavior in predictive ways. Individuals respond to certain physical cues that guide how they behave and react to others. Hypothetically, if women tended to be more cooperative, then they would be expected to behave in a certain way that reflects this trait. As a result, men would take on a more authoritative role when interacting with women, because this stereotype has been established and reinforced over time. From assumptions held by group members, status structures in groups mimic overarching societal status structures[17]. These expectations are based on behavior and differing levels of social esteem that influence those in a hierarchical setting, as in cases of race and gender. The theory then follows that individuals glean expectations from experience and then apply those expectations when making judgments about creativity.

It is currently unclear, however, if there are facial attributes specific to how individuals perceive others in a favorable, as opposed to unfavorable, way. Creativity does not possess a negative connotation, as do aggression, unethical behavior, untrustworthiness, and dominance. Yet many of these adverse traits can be associated with a creative individual. While much research focuses on the innate traits linked to fWHR, this research investigates how others classify men (with varying fWHR) as they generate an innovative idea. Drawing connections among aggression, dominance and status will determine if such impressions are congruent with stereotypes of highly creative people.

The Current Study

In this study, we hypothesize that individuals will perceive someone with a high facial width-to-height ratio, measured by facial width divided by height, as more creative than someone with a low facial width-to-height ratio. Furthermore, an idea pitched by someone with a high facial width-to-height ratio will be perceived as more creative than the same idea pitched by someone with a low facial width-to-height ratio. We expected the fWHR, as opposed to the overall image of a face, to be the driving force behind how respondents evaluate one's personal traits and the novelty and success of the product he designed. One implication of our theoretical perspective is the relationship between fWHR and aggression, alluding to bold assertions of creativity in highly creative people. Secondly, by looking at the positive associations between fWHR and dominance, we demonstrate that self-perceived high status might explain how fWHR and creativity are interconnected. In sum, we present evidence suggesting that the perception of creativity does differ by a person's appearance, which has yet to be fully explicated by previous research.

Method

Participants:

We aimed to recruit a minimum of 400 respondents to complete the survey. Participants were recruited by posting the survey on www.mturk.com and were compensated $0.50 for completing the survey.

Procedure:

Four surveys were distributed at random to participants on www.mturk.com. Each survey included a different image of "Steve," a white male with brown hair. There were four varieties of

Steve. Steve #1 and Steve #2 have low fWHR, and Steve #3 and Steve #4 have high fWHR (Figure 2). Steve #1 and Steve #3 are the same individual, manipulated to show a low vs. high fWHR. Steve #2 and Steve #4 are the same individual, manipulated to show a low vs. high fWHR. After seeing one randomly chosen image of Steve, the participant then answered five questions on a Likert scale from "Strongly Disagree" to "Strongly Agree." The questions assessed the levels of independence, creativity, trustworthiness, unethicalness, and aggression that the participants felt the target Steve possessed. Next, each survey showed a unique idea called the Rinser Tooth-Brush (Figure 3). The survey stated that the respective Steve shown invented the Rinser Tooth-Brush. Participants then answered ten questions about the novelty and potential success of the product on a Likert scale from "Strongly Disagree" to "Strongly Agree." See Appendix for survey instruments and Likert questionnaires.

Figure 2.

Steve #1 Steve #3

Steve #2 Steve #4

Figure 2. Steve #1 has a low fWHR, Steve #2 has a low fWHR, Steve #3 has a high fWHR, Steve #4 has a high fWHR. Steve #1 and Steve #3 are the same individual. Steve #2 and Steve #4 are the same individual.

Figure 3.

Figure 3. Participants were shown this image of a product called the Rinser Tooth-Brush and told that Steve came up with this product. The Rinser Tooth-Brush uses water pressure to create a built-in Power Fountain for easy mouth rinsing.

Study Measures:

The primary outcome measures were the five main traits that each respondent rated Steve on, mainly: creativity, trustworthiness, independence, aggression, and unethicalness. Each trait was measured on a Likert questionnaire item in which respondents were asked to assess their level of agreement with the statement. One represented the least amount of agreement and five represented the greatest amount of agreement. Secondarily, the novelty and success measures of the Rinser Tooth-Brush were captured. The novelty and success measures were similarly measured with Likert questionnaire items in which respondents were asked to assess their level of agreement with the statement. One represented the least amount of agreement and five represented the greatest amount of agreement. The fWHR and Steve images were recoded to categorical variables, following the coding pattern below in Table 1 where low fWHR equals zero and high fWHR equals one.

Table 1. fWHR and Steve Recoding Pattern

	fWHR	Steve
Steve #1	0	0
Steve #2	0	1
Steve #3	1	0
Steve #4	1	1

Statistics:

Univariate statistics were conducted to describe the five personality traits, including the range, means, and standard deviations. The novelty and success measures were also described with univariate statistics. Mean differences in the five personality traits by fWHR were examined using a one-way analysis of variance (ANOVA) test. A second one-way ANOVA was used to examine mean differences in the personality traits by each of the Steves. In a separate set of analyses, the product novelty and success measures were examined according to fWHR and each

of the Steves. Post-hoc tests were conducted following significant one-way ANOVA results to identify which groups contributed to the mean differences. Following the one-way ANOVAs, a two-way ANOVA was conducted to test for mean differences in the personality traits by both fWHR and each of the Steves. fWHR and each of the Steves were recoded into two separate binary variables to be treated as independent factors in the 2x2 analysis. Two-way analyses were only conducted for measures found to be significant in one-way ANOVAs.

All data were analyzed using IBM SPSS Statistics 23. All statistical tests were conducted at the $\alpha<0.05$ level.

Results

A total of 437 individuals responded to the survey. Two responses were found to be incomplete and were therefore excluded in final analyses. All personality traits had a range of one to five. The mean value for the five personality traits varied (Table 2). The independent trait had the highest mean score (m=3.57, sd=0.77). The unethical trait had the lowest mean score (m=2.63, sd=0.97).

Table 2. Personality Trait Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Creative	435	1.00	5.00	3.1356	.86536
Independent	435	1.00	5.00	3.5747	.77448
Aggressive	435	1.00	5.00	2.8828	1.09146
Trustworthy	435	1.00	5.00	3.0000	.96720
Unethical	435	1.00	5.00	2.6299	.97363

The test for the main effect of fWHR for perceived creativity, the 2x2 ANOVA, found a significant mean difference by Steve (F=10.07, p=0.00). However, there was slightly higher

creativity in lower fWHR compared to high fWHR (m=3.18 vs. m=3.10, respectively), but no statistically significant differences were found, (F=1.31, p=0.25) or by the interaction term (F=0.01, p=0.93). The graph of the estimated marginal means confirms there was no interaction between Steve and fWHR (Figure 4).

Table 3. 2x2 ANOVA Between-Subjects Effects

Dependent Variable: Creative

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	8.403[a]	3	2.801	3.813	.010
Intercept	4275.710	1	4275.710	5820.786	.000
Steve01	7.397	1	7.397	10.070	.002
fWHR	.964	1	.964	1.312	.253
Steve01 * fWHR	.006	1	.006	.008	.929
Error	316.595	431	.735		
Total	4602.000	435			
Corrected Total	324.998	434			

a. R Squared = .026 (Adjusted R Squared = .019)

Figure 4.

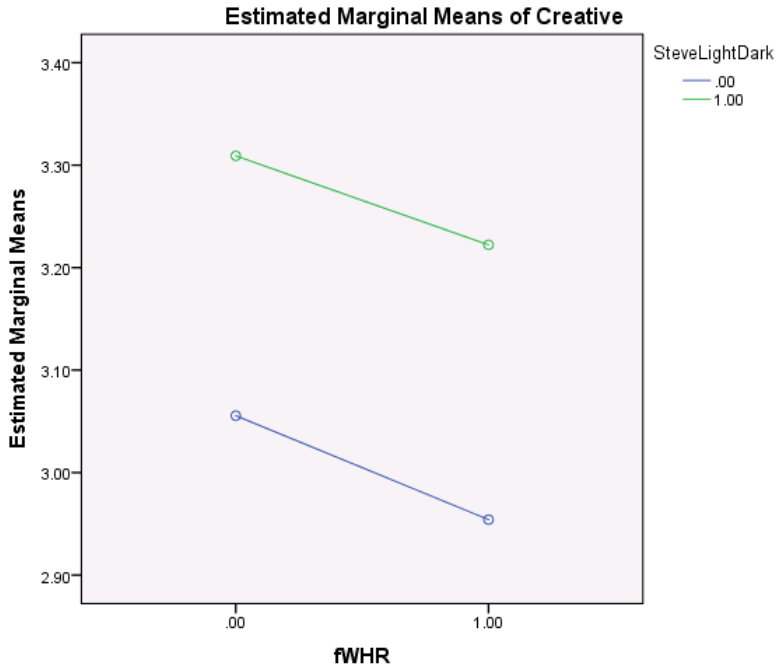


Figure 4. Estimated marginal means of creativity by fWHR and Steve number

In order to determine that there was truly no interaction, the data set was censored according to each Steve and a one-way ANOVA comparing mean creativity; fWHR was conducted separately for each Steve. There remained no significant differences in mean creativity by fWHR in the two separate censored data sets.

The different Steve and fWHR combinations also assessed differences in the perceived level of the additional four personality traits. The one-way ANOVAs examining the differences in the five personality traits by Steve and fWHR combinations revealed significant differences with some of the personality traits (Figure 4). Mean differences were found by perceived trustworthiness ($F=3.87$, $p=0.01$), with the differences existing between Steve #2 and Steve #3 ($\Delta=-0.37$, $p=0.02$) and between Steve #3 and Steve #4 ($\Delta=0.34$, $p=0.04$). Perceived aggression

also showed mean differences by Steve number (F=3.74, p=0.01) with the post-hoc tests showing the differences are between Steve #1 and Steve #4 (Δ=-0.43, p=0.02) and between Steve #3 and Steve #4 (Δ=-0.39, p=0.04). There were no significant differences between unethical and independence by Steve number and fWHR combinations. Similar to the main effect result with creativity, these results only showed differences by Steve, not by fWHR.

In terms of differences in product novelty and success measures, "a company could market this product," "the product is worth making," and "the product will be useful" were found to be significant (F=3.6, p=0.01; F=3.49, p=0.02; F=2.66, p=0.05; respectively). The remaining statements were found not to be significantly different by Steve number.

Discussion

General Discussion:

The primary objective of this study was to examine creativity as it relates to the facial width-to-height ratio of individuals. The one-way ANOVAs did reveal some significant differences by both personality traits and product. Results from the product novelty and success measures were interesting but none of them corresponded to creativity, which was the focus of the study. In terms of perceived product novelty and success, the significance of the statements that "a company could market this product," "the product is worth making," and "the product will be useful," suggested that the level of marketability, worthiness of making, and usefulness may be dependent on facial characteristics and may be worth further exploration.

A survey including two Likert scales, evaluating images of an individual based on appearance and then evaluating the potential novelty and success of his idea, was used to test

these relationships. The use of Likert scales could be subject to misrepresentation for several reasons, including central tendency bias, social desirability bias, and acquiescence bias. Central tendency bias occurs when respondents shy from using extreme responses; social desirability bias occurs when respondents try to portray themselves in a more favorable light; acquiescence bias occurs when respondents simply agree with the statements presented[18]. A scale with an equal number of positive and negative statements can prevent the acquiescence bias because the balance will be less likely to steer respondents' responses. The inclusion of statements not only about creativity, product novelty and product success, but also about a range of other attributes, allows such an equalizer. Future research should look at tools other than Likert scales that could control the central tendency bias and social desirability bias, both of which are harder to regulate.

Creativity, trustworthiness, and aggression varied by the different Steve and fWHR combinations, suggesting that the perception of these personality traits do differ by a person's appearance. However, once Steve and fWHR were analyzed separately, only Steve, and not fWHR, had mean differences. This happens because the Steve effect of the particular face being shown regardless of fWHR is so much stronger that it wipes away the ratio effect. In addition to fWHR the two Steves (#1/3 vs. #2/4) had a number of subtle differentiating characteristics that were not controlled for in this analysis. For example, Steve #1/3 had lighter hair and eyes, and Steve #2/4 had darker hair and eyes. Steve #1/3 was perceived as more creative by a noteworthy amount (Steve #1/3 m=3.26 vs. Steve #2/4 m=3.0). Perhaps certain facial characteristics or hairstyles affected how respondents viewed the Steve images and assessed their personality traits. Steve #1/3's lighter features and scruffier hairstyle might affect the way that respondents view him as a highly creative individual. In a follow-up study it would make sense to choose faces that

are more equivalent in terms of exhibiting stereotypical creative appearances to avoid this discrepancy.

The behaviors of people with high fWHR resemble narcissists in the sense that they will be confident and dominant. Since fWHR alone cannot convey these personality traits, it would be useful to conduct an in-person study to determine the combined impact of human interaction alongside a variety of fWHRs. Such a study should include individuals of varying fWHR, who pitch an idea in a lab setting, so that their faces can be measured and correlated with the judgments of creative ideas. The current study brings research on fWHR in the right direction of how fWHR must be correlated with the actual behavior that individuals possess. In turn, these facial traits are mapped onto behaviors and can be used to effectively judge creativity.

It was hypothesized that the same product pitched by someone with a high fWHR would be evaluated as more creative because of individual characteristics**.** These predictions were based on the knowledge that there are certain facial attributes, like fWHR, specific to how individuals perceive others. In this study it was proven that fWHR did not have mean differences regarding creativity. Additional research should be performed to explore the whether results would be different were fWHR not assumed to be sexually dimorphic. To further explore this, the individuals shown in survey images should include women, to better understand fWHR and the role of testosterone levels. Recent research suggests that while fWHR is associated with testosterone, there is no association between adult testosterone levels and the sexual dimorphism of face shape[5]. While these findings question sexual dimorphism, they do support existing research that testosterone is linked to fWHR and behavior. By studying the fWHR of both men and women, future research would allow for a better understanding of the relationships among fWHR, testosterone, and sexual dimorphism.

Furthermore, demographic variables may serve as mediators in the perception of creativity for this study. A number of different methodological iterations and control variables could strengthen further analysis, such as including both men and women's faces to distinguish sex differences. The sex of those in the survey images and the sex of survey respondents could impact responses. For instance, men might be perceived as unethical because of personal experiences that the respondent has had with certain men that trigger negative thoughts. Similarly, women might be perceived as more or less trustworthy for comparable reasons. Levels of perception could be mediated by respondents' biased characteristics of individuals. Race, age, and socioeconomic factors could all have similar implications for personality trait perceptions of the face presented by the characteristics of certain respondents. In future studies, survey responses should include demographic information, such as sex of respondent, to control for in analyses and to determine if sex, or other demographic data, is driving any perceptions of creativity.

In an organizational setting, the origination of ideas is crucial to the success of many businesses. Prior research[19] suggests that diverse groups of people who are put together by an organization with the intention of encouraging the sharing of ideas are inhibited by the possibility of embarrassment or being ignored or not taken seriously in front of others in the group setting. This informally established construction of the workplace leads to inhibiting genders from open interaction and ideation. The stereotyping that male workers face as being condescending to female workers is partially to blame for this divide. Therefore, an organization that is comprised of both men and women actually has less "creative output," because the mixed sexes are less inclined to openly share ideas. This vulnerability can be curtailed with shrewd strategies that include recognizing the mediating factors that can trigger creativity and

innovation, such as facial appearance or fWHR. Although extant research has broadened our understanding of how to stimulate creativity in organizations, there has been little attention paid to how physical features cohere to this. The application of this study and future research should seek to further understand the unique segment of creativity as it applies to facial appearance.

Theoretical Implications:

Our findings move research on fWHR forward in a number of important ways. First, our results are consistent with propositions related to facial appearance and the personality trait of aggression. While we expected fWHR to play a more important role than did facial appearance, recognizing how to mediate differences between the two can drive future research. A deeper understanding of the relationship between facial appearance and creativity may provide a theoretical framework within which future research can begin to investigate physical features, including fWHR, as they relate to creativity. These results are also potentially relevant to other settings, including organizations in which individuals are encouraged to express creative ideas, and how they might or might not be inclined to do so due to mediating factors.

Conclusion:

Future studies should be done to investigate why individuals are more sensitive to facial appearance as opposed to facial width-to-height ratio. Trends observed in this study show that there may be an association between facial appearance and judgments of creativity. If demographic variables and survey instruments are further assessed, it may have important implications for future research on both fWHR and creativity. The powerful effects of certain physical characteristics could be used to market creative ideas to others. This information could hopefully be used to improve the generation of ideas in organizations.

APPENDICES

Survey Instruments

Sample Person Description:
Please study this photograph of Steve and give us your first impressions of Steve based on this picture.
(A picture of one of the following Steves appears here)

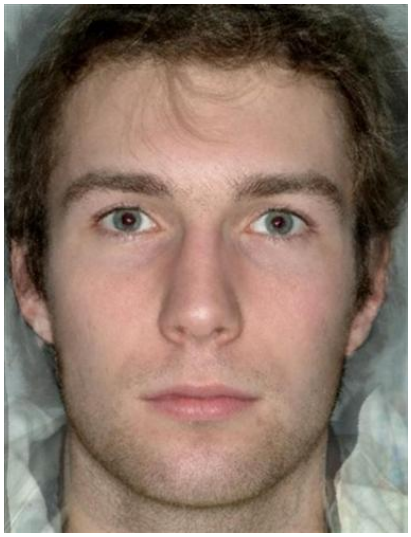
Sample Idea Description:
Now we're interested in your impressions of a new product. Steve came up with this product, called the Rinser Tooth-Brush. The Rinser Tooth-Brush uses water pressure to create a built-in Power Fountain for easy mouth rinsing.
(A picture of the product appears here)

Sample Items:
(Item filled out from "strongly disagree" to "strongly agree" on a Likert scale)

Steve seems independent
Steve seems creative
Steve seems trustworthy
Steve seems unethical
Steve seems aggressive

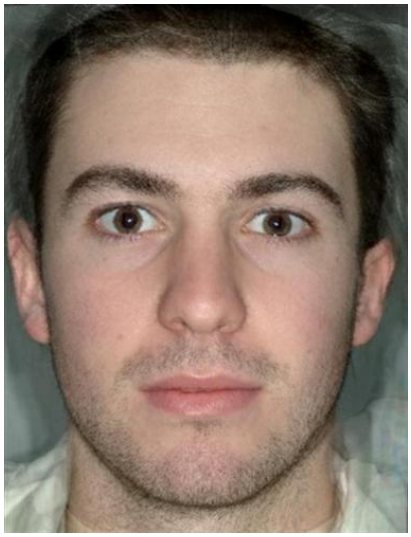
The product is novel
The product is useful
The product is creative
The product is similar to other products already on the market
The product is unique
The product will sell well
The product will be high quality
A company could market this product
The product is worth making
The product will be useful

Images:

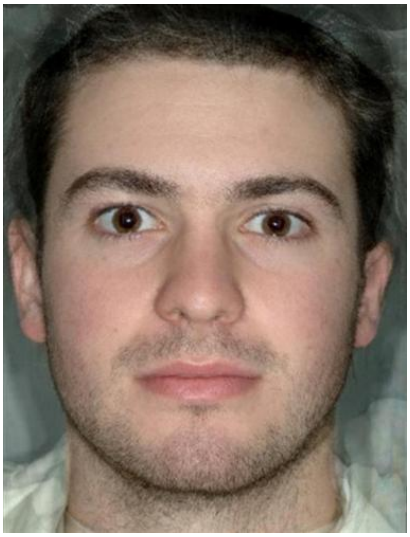


Steve #1

Steve #3



Steve #2



Steve #4

The Rinser Tooth-Brush

Supplemental Tables

Tests of Between-Subjects Effects

Dependent Variable: Creative

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	8.403[a]	3	2.801	3.813	.010
Intercept	4275.710	1	4275.710	5820.786	.000
Steve01	7.397	1	7.397	10.070	.002
fWHR	.964	1	.964	1.312	.253
Steve01 * fWHR	.006	1	.006	.008	.929
Error	316.595	431	.735		
Total	4602.000	435			
Corrected Total	324.998	434			

a. R Squared = .026 (Adjusted R Squared = .019)

1. SteveLightDark

Dependent Variable: Creative

SteveLightDark	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
.00	3.005	.058	2.890	3.119
1.00	3.266	.058	3.152	3.380

2. fWHR

Dependent Variable: Creative

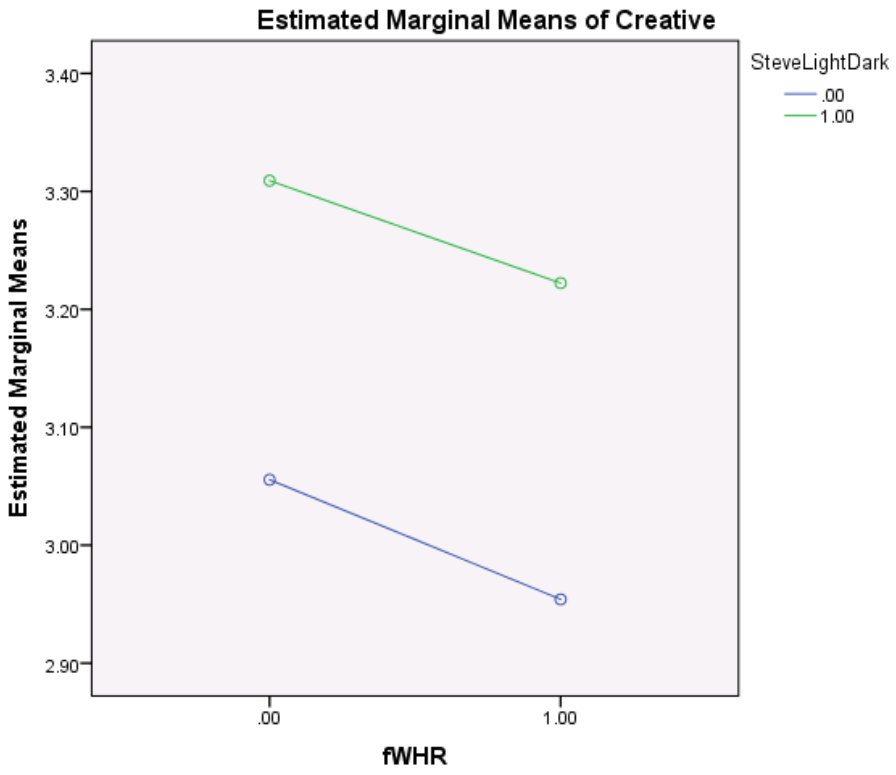
fWHR	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
.00	3.182	.058	3.068	3.296
1.00	3.088	.058	2.974	3.203

3. SteveLightDark * fWHR

Dependent Variable: Creative

SteveLightDark	fWHR	Mean	Std. Error	95% Confidence Interval

				Lower Bound	Upper Bound
.00	.00	3.056	.082	2.893	3.218
	1.00	2.954	.082	2.793	3.115
1.00	.00	3.309	.082	3.148	3.470
	1.00	3.222	.082	3.060	3.384



ANOVA

Aggressive

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.126	3	4.375	3.742	.011
Within Groups	503.894	431	1.169		
Total	517.021	434			

Multiple Comparisons

Dependent Variable: Aggressive

Tukey HSD

(I) SteveNumber	(J) SteveNumber	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1.00	2.00	-.26296	.14647	.277	-.6407	.1148
	3.00	-.04074	.14647	.992	-.4185	.3370
	4.00	**-.42844***	**.14613**	**.019**	**-.8053**	**-.0516**
2.00	1.00	.26296	.14647	.277	-.1148	.6407
	3.00	.22222	.14714	.432	-.1573	.6017
	4.00	-.16548	.14680	.673	-.5441	.2131
3.00	1.00	.04074	.14647	.992	-.3370	.4185
	2.00	-.22222	.14714	.432	-.6017	.1573
	4.00	**-.38770***	**.14680**	**.042**	**-.7663**	**-.0091**
4.00	**1.00**	**.42844***	**.14613**	**.019**	**.0516**	**.8053**
	2.00	.16548	.14680	.673	-.2131	.5441
	3.00	**.38770***	**.14680**	**.042**	**.0091**	**.7663**

*. The mean difference is significant at the 0.05 level.

ANOVA

Independent

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.373	3	1.458	2.455	.063
Within Groups	255.948	431	.594		
Total	260.322	434			

Multiple Comparisons

Dependent Variable: Independent

Tukey HSD

(I) SteveNumber	(J) SteveNumber	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1.00	2.00	.13653	.10439	.558	-.1327	.4058
	3.00	-.08569	.10439	.845	-.3549	.1835
	4.00	.15938	.10415	.420	-.1092	.4280

2.00	1.00	-.13653	.10439	.558	-.4058	.1327
	3.00	-.22222	.10487	.149	-.4927	.0482
	4.00	.02285	.10463	.996	-.2470	.2927
3.00	1.00	.08569	.10439	.845	-.1835	.3549
	2.00	.22222	.10487	.149	-.0482	.4927
	4.00	.24507	.10463	.090	-.0248	.5149
4.00	1.00	-.15938	.10415	.420	-.4280	.1092
	2.00	-.02285	.10463	.996	-.2927	.2470
	3.00	-.24507	.10463	.090	-.5149	.0248

ANOVA

Creative

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.403	3	2.801	3.813	.010
Within Groups	316.595	431	.735		
Total	324.998	434			

Multiple Comparisons

Dependent Variable: Creative

Tukey HSD

(I) SteveNumber	(J) SteveNumber	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	.25354	.11610	.129	-.0459	.5530
	3.00	.08687	.11610	.877	-.2126	.3863
	4.00	**.35496***	**.11583**	**.012**	**.0562**	**.6537**
2.00	1.00	-.25354	.11610	.129	-.5530	.0459
	3.00	-.16667	.11663	.482	-.4675	.1341
	4.00	.10143	.11636	.820	-.1987	.4015
3.00	1.00	-.08687	.11610	.877	-.3863	.2126
	2.00	.16667	.11663	.482	-.1341	.4675
	4.00	.26809	.11636	.099	-.0320	.5682
4.00	**1.00**	**-.35496***	**.11583**	**.012**	**-.6537**	**-.0562**
	2.00	-.10143	.11636	.820	-.4015	.1987
	3.00	-.26809	.11636	.099	-.5682	.0320

*. The mean difference is significant at the 0.05 level.

ANOVA

Trustworthy

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.646	3	3.549	3.869	.009
Within Groups	395.354	431	.917		
Total	406.000	434			

Multiple Comparisons

Dependent Variable: Trustworthy

Tukey HSD

(I) SteveNumber	(J) SteveNumber	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	.26667	.12974	.170	-.0679	.6013
	3.00	-.10370	.12974	.855	-.4383	.2309
	4.00	.23761	.12944	.258	-.0962	.5714
2.00	1.00	-.26667	.12974	.170	-.6013	.0679
	3.00	**-.37037***	**.13033**	**.024**	**-.7065**	**-.0342**
	4.00	-.02905	.13003	.996	-.3644	.3063
3.00	1.00	.10370	.12974	.855	-.2309	.4383
	2.00	**.37037***	**.13033**	**.024**	**.0342**	**.7065**
	4.00	**.34132***	**.13003**	**.044**	**.0059**	**.6767**
4.00	1.00	-.23761	.12944	.258	-.5714	.0962
	2.00	.02905	.13003	.996	-.3063	.3644
	3.00	**-.34132***	**.13003**	**.044**	**-.6767**	**-.0059**

*. The mean difference is significant at the 0.05 level.

ANOVA

Unethical

	Sum of Squares	df	Mean Square	F
Between Groups	3.950	3	1.317	1.393
Within Groups	407.461	431	.945	
Total	411.411	434		

Multiple Comparisons

Dependent Variable: Unethical

Tukey HSD

(I) SteveNumber	(J) SteveNumber	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1.00	2.00	-.13923	.13171	.716	-.4789	.2005
	3.00	-.05589	.13171	.974	-.3956	.2838
	4.00	-.25246	.13141	.221	-.5914	.0864
2.00	1.00	.13923	.13171	.716	-.2005	.4789
	3.00	.08333	.13231	.922	-.2579	.4246
	4.00	-.11323	.13201	.827	-.4537	.2272
3.00	1.00	.05589	.13171	.974	-.2838	.3956
	2.00	-.08333	.13231	.922	-.4246	.2579
	4.00	-.19657	.13201	.445	-.5370	.1439
4.00	1.00	.25246	.13141	.221	-.0864	.5914
	2.00	.11323	.13201	.827	-.2272	.4537
	3.00	.19657	.13201	.445	-.1439	.5370

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
prod1	Between Groups	.745	3	.248	.264	.852
	Within Groups	406.142	431	.942		
	Total	406.887	434			
prod2	Between Groups	4.315	3	1.438	.997	.394
	Within Groups	621.961	431	1.443		
	Total	626.276	434			
prod3	Between Groups	1.094	3	.365	.544	.652
	Within Groups	288.920	431	.670		
	Total	290.014	434			
prod4	Between Groups	2.691	3	.897	1.028	.380
	Within Groups	376.196	431	.873		
	Total	378.887	434			
prod5	Between Groups	2.372	3	.791	1.206	.307
	Within Groups	282.626	431	.656		
	Total	284.998	434			
prod6	Between Groups	5.967	3	1.989	1.648	.178
	Within Groups	520.299	431	1.207		
	Total	526.267	434			
prod7	Between Groups	2.703	3	.901	1.054	.368
	Within Groups	368.433	431	.855		
	Total	371.136	434			
prod8	Between Groups	11.814	3	3.938	3.603	.014
	Within Groups	471.069	431	1.093		
	Total	482.883	434			
prod9	Between Groups	14.261	3	4.754	3.494	.016
	Within Groups	586.392	431	1.361		
	Total	600.653	434			
prod10	Between Groups	11.574	3	3.858	2.660	.048
	Within Groups	625.010	431	1.450		
	Total	636.584	434			

Tukey HSD

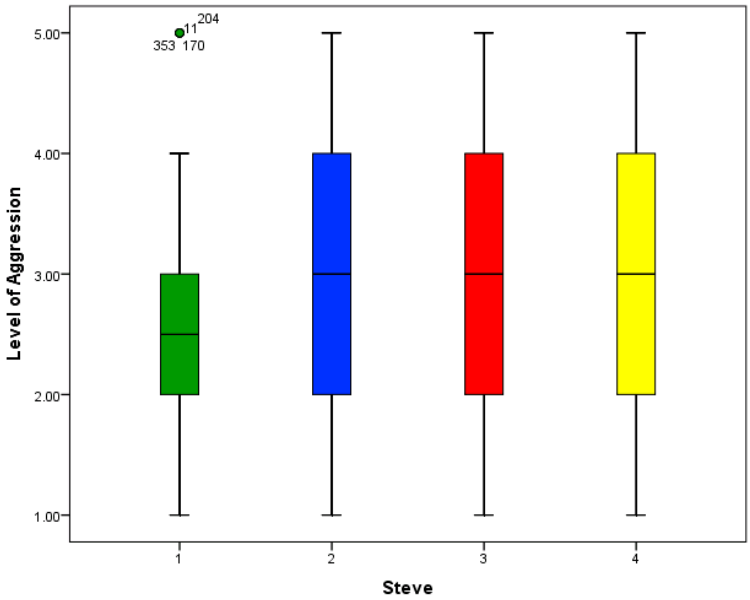
ependent Variable	(I) SteveNumber	(J) SteveNumber	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bou
prod1	1.00	2.00	.065	.131	.961	-.27	.40
		3.00	.028	.131	.997	-.31	.37
		4.00	.110	.131	.836	-.23	.45
	2.00	1.00	-.065	.131	.961	-.40	.27
		3.00	-.037	.132	.992	-.38	.30
		4.00	.045	.132	.986	-.29	.39
	3.00	1.00	-.028	.131	.997	-.37	.31
		2.00	.037	.132	.992	-.30	.38
		4.00	.082	.132	.924	-.26	.42
	4.00	1.00	-.110	.131	.836	-.45	.23
		2.00	-.045	.132	.986	-.39	.29
		3.00	-.082	.132	.924	-.42	.26
prod2	1.00	2.00	.011	.163	1.000	-.41	.43
		3.00	.039	.163	.995	-.38	.46
		4.00	.244	.162	.437	-.17	.66
	2.00	1.00	-.011	.163	1.000	-.43	.41
		3.00	.028	.163	.998	-.39	.45
		4.00	.233	.163	.482	-.19	.65
	3.00	1.00	-.039	.163	.995	-.46	.38
		2.00	-.028	.163	.998	-.45	.39
		4.00	.205	.163	.590	-.22	.63
	4.00	1.00	-.244	.162	.437	-.66	.17
		2.00	-.233	.163	.482	-.65	.19
		3.00	-.205	.163	.590	-.63	.22
prod3	1.00	2.00	.024	.111	.996	-.26	.31
		3.00	-.059	.111	.951	-.35	.23
		4.00	.081	.111	.885	-.20	.37
	2.00	1.00	-.024	.111	.996	-.31	.26
		3.00	-.083	.111	.878	-.37	.20
		4.00	.057	.111	.957	-.23	.34
	3.00	1.00	.059	.111	.951	-.23	.35
		2.00	.083	.111	.878	-.20	.37
		4.00	.140	.111	.590	-.15	.43
	4.00	1.00	-.081	.111	.885	-.37	.20
		2.00	-.057	.111	.957	-.34	.23
		3.00	-.140	.111	.590	-.43	.15
prod4	1.00	2.00	.020	.127	.999	-.31	.35

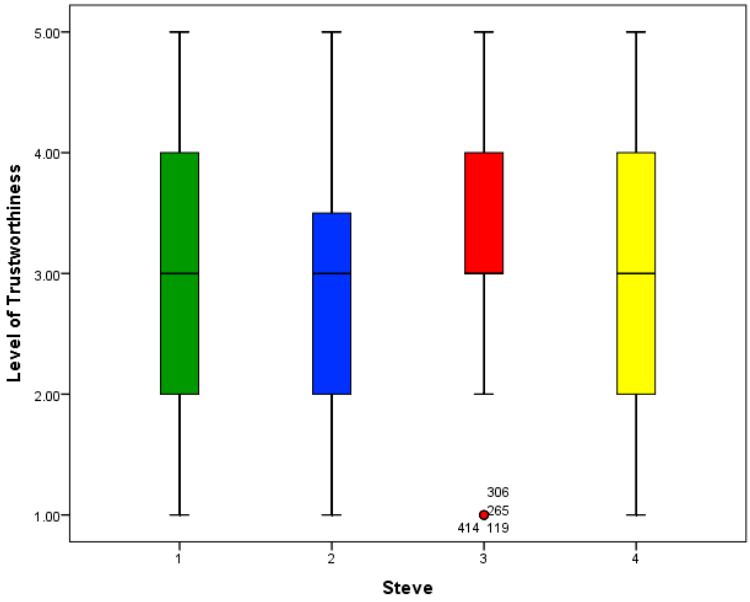
		3.00	.001	.127	1.000	-.33	.33
		4.00	-.174	.126	.515	-.50	.15
	2.00	1.00	-.020	.127	.999	-.35	.31
		3.00	-.019	.127	.999	-.35	.31
		4.00	-.193	.127	.424	-.52	.13
	3.00	1.00	-.001	.127	1.000	-.33	.33
		2.00	.019	.127	.999	-.31	.35
		4.00	-.175	.127	.514	-.50	.15
	4.00	1.00	.174	.126	.515	-.15	.50
		2.00	.193	.127	.424	-.13	.52
		3.00	.175	.127	.514	-.15	.50
prod5	1.00	2.00	-.022	.110	.997	-.30	.26
		3.00	.006	.110	1.000	-.28	.29
		4.00	.164	.109	.442	-.12	.45
	2.00	1.00	.022	.110	.997	-.26	.30
		3.00	.028	.110	.994	-.26	.31
		4.00	.185	.110	.333	-.10	.47
	3.00	1.00	-.006	.110	1.000	-.29	.28
		2.00	-.028	.110	.994	-.31	.26
		4.00	.157	.110	.480	-.13	.44
	4.00	1.00	-.164	.109	.442	-.45	.12
		2.00	-.185	.110	.333	-.47	.10
		3.00	-.157	.110	.480	-.44	.13
prod6	1.00	2.00	-.026	.149	.998	-.41	.36
		3.00	-.118	.149	.857	-.50	.27
		4.00	.203	.148	.521	-.18	.59
	2.00	1.00	.026	.149	.998	-.36	.41
		3.00	-.093	.150	.926	-.48	.29
		4.00	.229	.149	.419	-.16	.61
	3.00	1.00	.118	.149	.857	-.27	.50
		2.00	.093	.150	.926	-.29	.48
		4.00	.321	.149	.138	-.06	.71
	4.00	1.00	-.203	.148	.521	-.59	.18
		2.00	-.229	.149	.419	-.61	.16
		3.00	-.321	.149	.138	-.71	.06
prod7	1.00	2.00	-.030	.125	.995	-.35	.29
		3.00	.016	.125	.999	-.31	.34
		4.00	.173	.125	.510	-.15	.50

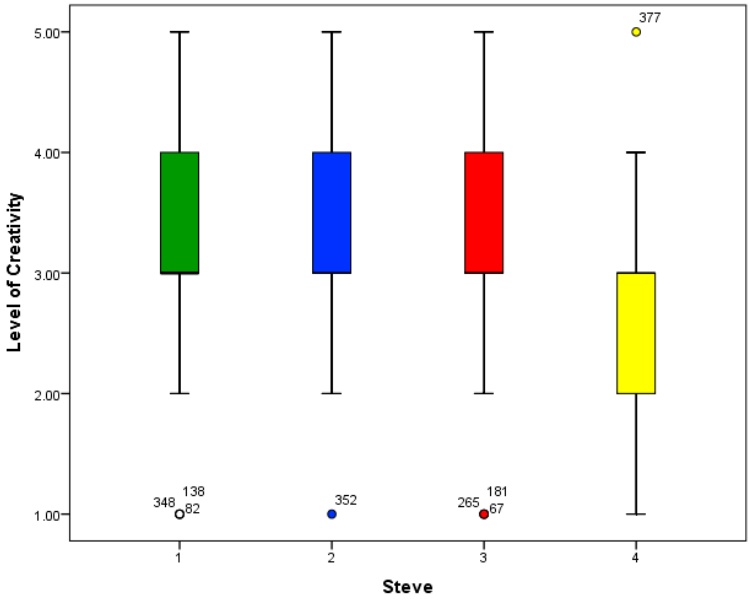
	2.00	1.00	.030	.125	.995	-.29	.35
		3.00	.046	.126	.983	-.28	.37
		4.00	.203	.126	.368	-.12	.53
	3.00	1.00	-.016	.125	.999	-.34	.31
		2.00	-.046	.126	.983	-.37	.28
		4.00	.157	.126	.594	-.17	.48
	4.00	1.00	-.173	.125	.510	-.50	.15
		2.00	-.203	.126	.368	-.53	.12
		3.00	-.157	.126	.594	-.48	.17
prod8	1.00	2.00	-.069	.142	.962	-.43	.30
		3.00	.042	.142	.991	-.32	.41
		4.00	.360	.141	.054	.00	.72
	2.00	1.00	.069	.142	.962	-.30	.43
		3.00	.111	.142	.863	-.26	.48
		4.00	.429*	.142	.014	.06	.80
	3.00	1.00	-.042	.142	.991	-.41	.32
		2.00	-.111	.142	.863	-.48	.26
		4.00	.318	.142	.114	-.05	.68
	4.00	1.00	-.360	.141	.054	-.72	.00
		2.00	-.429*	.142	.014	-.80	-.06
		3.00	-.318	.142	.114	-.68	.05
prod9	1.00	2.00	-.043	.158	.993	-.45	.36
		3.00	.096	.158	.929	-.31	.50
		4.00	.419*	.158	.040	.01	.83
	2.00	1.00	.043	.158	.993	-.36	.45
		3.00	.139	.159	.818	-.27	.55
		4.00	.462*	.158	.019	.05	.87
	3.00	1.00	-.096	.158	.929	-.50	.31
		2.00	-.139	.159	.818	-.55	.27
		4.00	.323	.158	.175	-.09	.73
	4.00	1.00	-.419*	.158	.040	-.83	-.01
		2.00	-.462*	.158	.019	-.87	-.05
		3.00	-.323	.158	.175	-.73	.09
prod10	1.00	2.00	-.164	.163	.746	-.58	.26
		3.00	.012	.163	1.000	-.41	.43
		4.00	.290	.163	.282	-.13	.71
	2.00	1.00	.164	.163	.746	-.26	.58

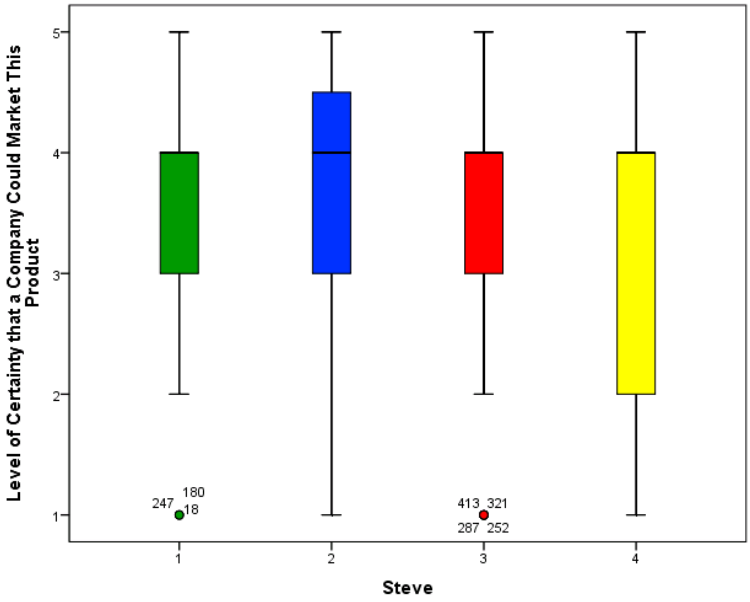
	3.00	.176	.164	.706	-.25	.60
	4.00	.454*	.163	.029	.03	.88
3.00	1.00	-.012	.163	1.000	-.43	.41
	2.00	-.176	.164	.706	-.60	.25
	4.00	.278	.163	.324	-.14	.70
4.00	1.00	-.290	.163	.282	-.71	.13
	2.00	-.454*	.163	.029	-.88	-.03
	3.00	-.278	.163	.324	-.70	.14

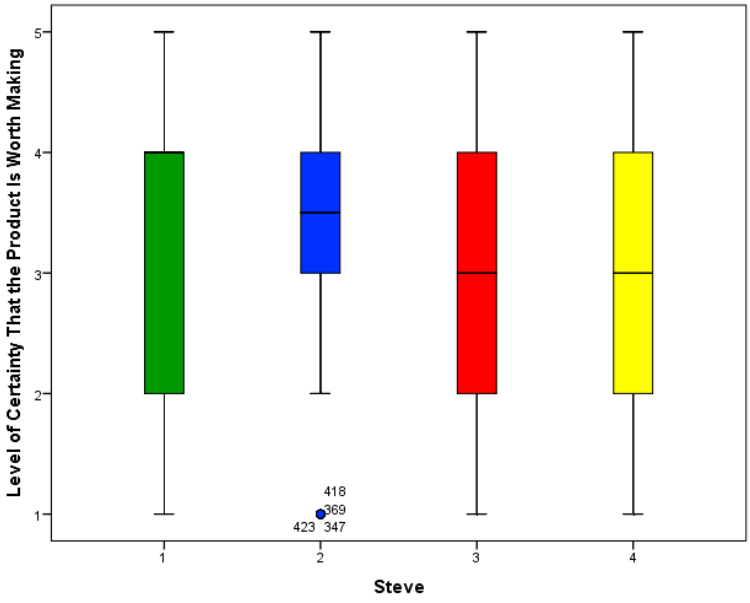
*. The mean difference is significant at the 0.05 level.

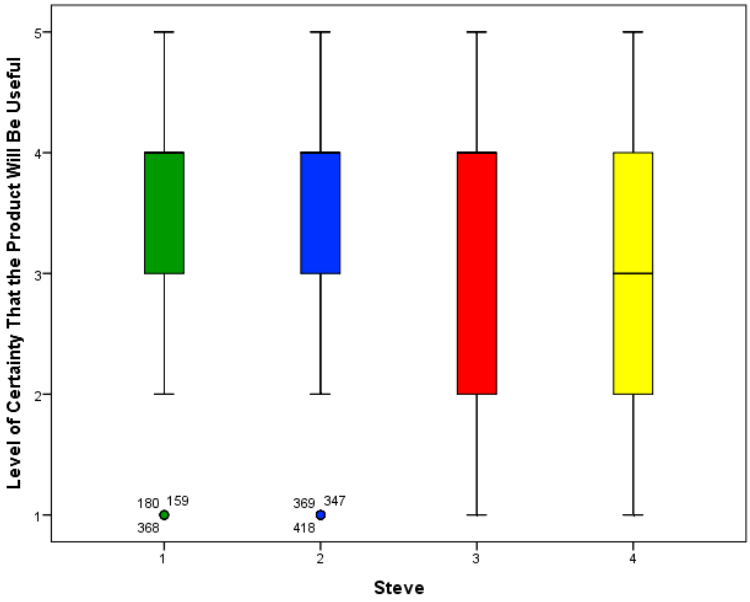



Level of Trustworthiness
5.00
4.00
3.00
2.00
1.00
306
265
414
119
1
2
3
4
Steve


Level of Creativity
5.00
4.00
3.00
2.00
1.00
377
138
348
82
352
181
265
67
1
2
3
4
Steve


Level of Certainty that a Company Could Market This Product
5
4
3
2
1
247
180
18
413
321
287
252
1
2
3
4
Steve


Level of Certainty That the Product Is Worth Making
5
4
3
2
1
418
369
423
347
1
2
3
4
Steve


Level of Certainty That the Product Will Be Useful
5
4
3
2
1
180
159
368
369
347
418
1
2
3
4
Steve

REFERENCES

1. Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of personality and social psychology*, *45*(2), 357.

2. Sternberg, R. J. (1988). *The nature of creativity: Contemporary psychological perspectives*. CUP Archive.

3. Weisberg, R. W. (1988). Problem solving and creativity. In *The Nature of Creativity: Contemporary Psychological Perspectives* (pp. 148-176). Cambridge: Cambridge University Press.

4. Amabile, T. M., Barsade, S. G., Mueller, J. S., & Staw, B. M. (2005). Affect and creativity at work. *Administrative science quarterly*, *50*(3), 367-403.

5. Lefevre, C. E., Lewis, G. J., Perrett, D. I., & Penke, L. (2013). Telling facial metrics: facial width is associated with testosterone levels in men. *Evolution and Human Behavior*, *34*(4), 273-279.

6. Lewis, G. J., Lefevre, C. E., & Bates, T. C. (2012). Facial width-to-height ratio predicts achievement drive in US presidents. *Personality and Individual Differences*, *52*(7), 855-857.

7. Goncalo, J. A., Flynn, F. J., & Kim, S. H. (2010). Are two narcissists better than one? The link between narcissism, perceived creativity, and creative performance. *Personality and Social Psychology Bulletin*, *36*(11), 1484-1495.

8. Haselhuhn, M. P., Ormiston, M. E., & Wong, E. M. (2015). Men's facial width-to-height ratio predicts aggression: a meta-analysis. *PloS one*, *10*(4), e0122637.

9. Duguid, M. M., & Goncalo, J. A. (2015). Squeezed in the middle: The middle status trade creativity for focus. *Journal of personality and social psychology*, *109*(4), 589.

10. Goncalo, J. (2013, October). Intrinsic motivation and creativity. Lecture conducted from Cornell University, Ithaca, NY.

11. Verdonck, A., Gaethofs, M., Carels, C., & de Zegher, F. (1999). Effect of low-dose testosterone treatment on craniofacial growth in boys with delayed puberty. *The European Journal of Orthodontics*, *21*(2), 137-143.

12. Frantz, A. G., & Rabkin, M. T. (1965). Effects of estrogen and sex difference on secretion of human growth hormone. *The Journal of Clinical Endocrinology and Metabolism*, 25(11), 1470–1480.

13. Mazur, A., & Booth, A. (1998). Testosterone and dominance in men. *The Behavioral and Brain Sciences*, 21, 353–363.

14. Carré, J. M., & McCormick, C. M. (2008). In your face: facial metrics predict aggressive behaviour in the laboratory and in varsity and professional hockey players. *Proceedings of the Royal Society B: Biological Sciences*, *275*(1651), 2651–2656. http://doi.org/10.1098/rspb.2008.0873

15. Haselhuhn, M. P., & Wong, E. M. (2011). Bad to the bone: facial structure predicts unethical behaviour. *Proceedings of the Royal Society of London B: Biological Sciences*, rspb20111193.

16. Gomulya, D., Wong, E. M., Ormiston, M. E., & Boeker, W. (2015). The Role of Facial Appearance on CEO Selection after Firm Misconduct. *Unpublished working paper, University of California at Riverside*.

17. Correll, S. J., & Ridgeway, C. L. (2006). Expectation states theory. In *Handbook of social psychology* (pp. 29-51). Springer Us.

18. Barnette, J. J. (2000). Effects of stem and Likert response option reversals on survey internal consistency: If you feel the need, there is a better alternative to using those negatively worded stems. *Educational and Psychological Measurement*, *60*(3), 361-370.

19. Goncalo, J. A., Chatman, J. A., Duguid, M. M., & Kennedy, J. A. (2015). Creativity from Constraint? How the Political Correctness Norm Influences Creativity in Mixed-sex Work Groups. *Administrative Science Quarterly*, *60*(1), 1-30.