

Title: How to Write a Research Paper Methods, Results, Discussion, and Conclusions Without Developing an Overwhelming and Compulsive Urge to Kill

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I. Methods

A. Participants: Report information regarding participants here.

1. number of participants.
2. demographic characteristics:
 - gender (number or % of each)
 - ethnicity (African American, Asian Pacific Islander, Native American, Hispanic and/or Latino, Caucasian, and other),
 - age range
 - average age
 - Socioeconomic Status
 - Level of Education
 - Class rank if college students are used.
 - relationship status if applicable (single, dating, engaged, married, separated, divorced).
 - If you are studying animals then call the section Subjects and report the genus, species, strain, name and location of supplier, number of animals, sex, age, weight, and physiological condition (APA, 2009, p. 30).
3. describe where from, how selected, how assigned to groups (if applicable), and incentives for participation (e.g., payment or course credit).

For Example: (note that this should be double spaced)

Methods

Participants

Participants were 120 undergraduate college students attending a medium sized Southeastern university who were given course credit for their participation. Participants ranged in age from 18 to 26, with a mean age of 18.94. A majority of the participants were female (70%) and 30% were male. Also, a majority of the participants was Caucasian (85.8%), 9.2% were African-American, 1% were Asian/Pacific Islander, less than 1% were Native-American, less than 1% were Hispanic, and 2.5% reported "other" ethnicity. A majority of the participants were freshmen (85.8%), 10.8% were sophomores, 1.7% were juniors, and 1.7% were seniors. The average GPA reported was 3.16 with a range of 2.30. A majority of the participants were single (92.5%), 3.3% were married, 2.5% were divorced, 1.7% were engaged.

4. If they have important characteristics, describe them, e.g., depressed or ADHD, and how determined.
5. if participants excluded, explain why and describe criteria for inclusion in the study. Also, report final sample size.
 - e.g. "Two participants were excluded from the study do to their lack of hepatic tissue (no liver) and their advanced state of death. The remaining sample consisted of 178 participants."

B. Materials (Measures / Apparatus)

1. If you are using paper pencil tests (questionnaires) or their computer equivalents each one used should be described in detail and include examples of items, a description of how measures were computed from the questionnaires, the mean, the standard deviation, and the range. Also, for scales with multiple items, the Cronbach's Alpha should be reported. For Example: (Note, this should be double spaced)

Measures

A measure of fearful animal attitudes was obtained using Aspelmeier's (2002) Radford Avoidant

Beast Interaction Test (RABIT) which assesses the degree of participant's negative attitudes regarding small furry animals and their perceived likelihood of avoiding interactions with small furry animals. Participants rated 12 items on a seven point numerical rating scale as to how descriptive they were of them (1 = very unrepresentative of me, 7= very descriptive of me). The RABIT produces two factors that underlay fearful animal attitudes: Negative Attitudes Toward Small Furry Animals (NATSFA) and Avoidant Interactions with Small Furry Animals (AISFA). Examples of the NATSFA scale items are: 1) "The Easter Bunny makes me sweat" and 2) "I often feel that vicious rabbits are lurking in the shadows." Examples of the AISFA scale items are: 1) "I would probably never go to a park that did not implement squirrel control techniques" and 2) "I would never wear a baby seal fur coat for fear of being attacked by it." Factor scores were created by summing the scores for respective items such that a higher score indicated more negative attitudes toward small furry animals and greater likelihood that one would avoid interactions with small furry animals. For the NATSFA, $M = 4.55$, $SD = 2.12$, and range = 6.99. Cronbach's Alpha (an estimate of internal consistency) was .89. For the AISFA, $M = 3.89$, $SD = 2.57$, and range = 6.85. Cronbach's Alpha was .88.

2. If you are using some kind of equipment or computer software to test participants then describe the equipment fully. (Note: sometimes this can be embedded in the procedures especially if your IV depends on how the equipment is set up, e.g. group 1 gets set up A and group 2 gets set up B).
For Example:

Apparatus

A second assessment of small furry animal phobia was obtained using the Stimulus Induced Pit Sweat procedure (SIPS), which measures participants' armpit emissions in response experimentally assigned visual stimuli. Participants' armpits are first fitted with electronic moisture collection cups (Model Number THX-1138, Lafayette Instrument Co., Lafayette, IN). These cups record the amount of sweat produced by each armpit in milliliters (ml). The sweat emissions from each pit are averaged from a single score where a higher value indicates greater sweat output. It should be noted that it was requested that participants avoid use of antiperspirants for at least three days prior to testing. After a baseline level of sweating is established for each participant, participants are shown a series of stimuli consisting of either photographs of inanimate objects, photographs of small woodland creatures, or cartoon caricatures of small woodland creatures. Each image is shown for 1500 ms with a 750 ms interval between stimuli. The stimuli are presented on a PC using SuperLab 3.1 (Cedrus Corporation, Palos Verde Estates, CA) stimulus presentation software. Sweat output was measured for 3 minutes following stimulus exposure. A difference score was calculated according to the formula (Post Stimulus Score - Pre Exposure Baseline), such that a higher score indicated that participants' sweat production increased after exposure to the test stimulus. The average amount of sweat production across all stimulus types was $M = 1.56$, $SD = 12.54$, range = 64.85.

C. Procedure

1. Include a complete description of what happened to a typical subject, in chronological order, from beginning to end. If appropriate, include any unexpected additions to the study.
2. Include the description of the design (experimental, quasi-experimental, longitudinal, etc).
3. Provide an operational definition of the IV (this definition should be the most descriptive one given in the paper).
4. Provide an operational definition of the DV (this def. Should be the most descriptive one given in the paper). Describe how changes in the DV will be observed and recorded.
For Example:

Procedures

In a mixed correlational and experimental treatment design, participants initially agreed to spend two consecutive nights in the Radford Animal Avoidance Research-Center (RAAR), After receiving

informed consent, a catheter was surgically inserted into the participant's gal-bladder. Over the first night of testing, hepatic secretions were measured. The average rate of bile production was recorded in milliliters per hour, $M = 3.2$, $SD = 1.8$, range = 13.5. After the first night, the catheter was removed and participants were allowed to continue with their daily routine until 9:30 pm at which time they returned to the lab for further testing. During the second night of testing, pancreatic secretions were measured. Participants' blood sugar levels were measured every hour, in order to establish each individual's rate of insulin production measured in micrograms per hour, $M = 12.5$, $SD = 7.2$, range = 50. After the second night of testing, participants completed the RABIT. Finally, Participants completed the SIPS assessment. After completing the procedures participants were debriefed, thanked for their participation, and asked if they had any questions or concerns. Participants were also given the research team's contact information should any health problems arise as a result of participation in the study.

It should be noted that during the second night of testing, it was discovered that several participants (33) were not secreting insulin do to diabetes. It was decided not to exclude these participants in that it would be useful to compare these participants with non-diabetic participants with respect to small furry animal phobia.”

D. Data Analysis Plan:

Some journals ask you to include a brief description of the manner in which you plan to analyze your data. The idea is to give the reader a roadmap to the analyses you plan to conduct. This is especially important if you are conducting very complicated analyses or you analyses that the average reader may not be familiar with. It is also a really good idea to include a data analysis plan when you are writing any sort of research proposal.

Data Analysis Plan

In the present study, the data analyses will be conducted in two steps: demographic analyses and main analyses. The demographic analyses will compare the demographic variables with the main variables of interest to identify any potentially confounding relationships. These analyses will consist of a series of univariate analyses consisting of Pearson's chi square tests to test association between categorical variables, Pearson's product moment correlations to test association between numerical variables, and independent sample *t*-tests and one-way ANOVAs to test associations between categorical and numerical variables.

The main analyses tests a series of hypotheses using a univariate approach. Association between bile production and RABIT subscales will be tested with a series of Pearson's correlations. A second set of analyses will first compare the change in armpit sweat scores among participants who have been exposed to different visual stimuli (inanimate object, small animal photos, and small animal cartoons) using three one-way ANOVA procedures. The first ANOVA will compare scores for the entire sample. The ANOVA will compare scores just for participants who score above the mean on the NATSFA subscale of the RABIT. The third ANOVA will compare scores just for participants scoring below the mean on the NATSFA. The final set of analyses uses Pearson's *r* to test the remaining hypotheses. The first of these correlation tests the association between bile production and pit sweat change scores among participants who were exposed to visual stimuli including small woodland creatures. The remaining correlations test the association between pancreatic secretions and the NATSFA and AISFA subscales of the RABIT.

- Note that this example did not go over all of the hypotheses that were tested. A complete data analysis plan would include how all of the hypotheses would be tested.

II. Results (note: on your paper, the results title will be centered and will not have a roman numeral beside it)

A. This section contains all of the results, but no conclusions.

1. order: Descriptive statistics first, Tests with Demographic Variables second, and Inferential statistics second.

B. Descriptive Data: Here we present the either the group frequencies (for Discrete variables) or means, standard deviations, and ranges (for Continuous variables) for all variables, unless already provided in the Methods section (as was done here).

C. Demographic Analyses: The purpose of these analyses is to establish that your demographic variables are not contributing to (or confounding) the associations we find between the Main Vars. (i.e, IV's and DV's). For this paper, the demographic analyses will be the first part of the results section.

- a. Tell the reader what variables were tested and which analyses were significant, if any
Example 1: If no Significant Associations were found....

Results

Demographic Analyses

In order to identify associations between demographic variables (age, GPA, sex, ethnicity, and class rank) and the main variables of interest (bile production rate, insulin production rate, diabetics vs. non-diabetics, Pit Sweat stimulus type, Pit Sweat volume change, NATSFA, and AISFA), a series of preliminary analyses were conducted. None of the preliminary analyses were significant. The demographic variables were excluded from further analyses.

- b. When you have significant associations, tell the reader what variables were associated and report the statistic. Also, explain to the reader what the statistics mean by referring to people and their behavior.

Example 2: If significant Associations were found...

Results

Demographic Analyses

In order to identify associations between demographic variables (age, GPA, sex, ethnicity, and class rank) and the main variables of interest (bile production rate, insulin production rate, diabetics vs. non-diabetics, Pit Sweat stimulus type, Pit Sweat volume change, NATSFA, and AISFA), a series of preliminary analyses were conducted. A significant positive correlation was found between GPA and pit sweat volume change, $r(118) = -.56, p < .001$. Participants with higher grade point averages tend to show higher levels of armpit perspiration following exposure to photos of small woodland creatures. Also, participants in the small woodland creature cartoon stimulus condition had significantly higher GPA's, compared to participants in the other conditions, $F(2, 117) = 3.45, p = .035, \eta^2 = .06$. Means (Standard Deviations) for the cartoon animals, photographed animals, and inanimate objects conditions were 3.22 (.3235), 2.82 (.3811), and 2.88 (.3756), respectively. Finally, there was a significant association between sex and diabetic status, $\chi^2(1, N = 120) = 10.03, p = .002, \Phi = .29$. Specifically, females less likely to be diabetic, while males were significantly over represented among diabetic participants. See Table 1 for crosstabulations. None of the remaining analyses were significant.

D. Main Analyses: Here we restate the hypotheses between the main variables (describe your hypotheses with respect to the relationships between variables and scores), tell what statistics were used to test this hypothesis, and then give the results of the test, and describe the behavior.

Example.

Main Analysis

To test the hypothesis that hepatic secretions would be associated with self reports of small furry animal phobia, a series of correlations between Bile Production and scores on the RABIT self report were computed. Bile Production was significantly positively associated with the NATSFA subscale and the AISFA subscale, $r(176) = .49, p < .001$; $r(176) = .67, p < .001$, respectively. Participants who produced greater amounts of bile reported more negative attitudes toward small furry animals and that they were more likely to avoid interactions with small furry animals.

Also, it was hypothesized that exposure to visual stimuli depicting small woodland creatures would be associated with greater amounts of pit sweating, but only when participants score high on the NATSFA subscale of the RABIT. To this end, the pit sweating volume change of participants scoring

above the mean on the NATSFA was compared with that of participants scoring below the mean (60 participants were included in each group) across the 3 stimulus conditions (Inanimate Objects, Animal Pictures, and Animal Cartoons). To test this hypothesis, One-way ANOVA's were computed, first for the total sample (irrespective of NATSFA score) and then separately for the participants scoring above and below the mean on the NATSFA. For the total sample, there was a significant effect for the stimulus condition, $F(2, 174) = 6.67, p < .001, \eta^2 = .07$. Results of Fisher LSD post-hoc tests revealed that photographs and caricatures of small animals elicited more pit sweating than inanimate objects, with means and standard deviations of 20.00 (5.34), 19.5 (5.13), and 3.00 (5.22), respectively. Also, participants with high NATSFA scores showed more pit sweating in the caricature and photo conditions than in the inanimate object condition (See Table 2). Further, participants scoring low on the NATSFA did not differ in pit sweating across the 3 conditions. Figure 1 displays group means graphically.

– Note that the preceding paragraphs are both examples where the test statistics are reported in the text and examples where the test statistics are reported in a table and figure. When you have several statistical tests that are very similar it is often preferable to put the data in a table. You can do either, but the stats must be reported somewhere. Further, even if you put the stats in a table, you must describe/explain the results in the text. Remember that your explanations should focus on people and their behaviors, rather than variables and scores.

– Also, for the more advanced statistical users, you may have noticed that the hypothesis tested in paragraph two of the example above would really best be tested using a Two-way ANOVA (Factorial Anova) rather than a series of One-way ANOVAs. See the Appendix of this handout for an example of how to report the same results tested with a Two-way ANOVA.

Example Continued:

With respect to hepatic secretions, it was hypothesized that bile production would be associated with behavioral measures of animal avoidance. Bile production was significantly positively correlated with pit sweat volume change among participants who were exposed to either photos or cartoons of small woodland creatures, $r(78) = .39, p < .001$.

With respect to pancreatic secretions, it was hypothesized that insulin production would be associated with self report measures of animal attraction. Contrary to the expected results, no significant associations were found between insulin production rate and the NATSFA or AISFA measures, $r(118) = .14, p = .23, ns$, and $r(118) = .11, p = .58, ns$, respectively.

- You will notice that not all the possible hypotheses are tested in this handout. These are omitted to conserve space in the handout. However, your paper should report all the statistics for all of the hypotheses tested. Regardless of whether they are significant or not.

II. Discussion:

- A. This section contains the conclusions that can be drawn from the results of your data analysis.
 1. Start by once again restating the studies hypothesis. It should be more general than the description you gave in the previous sections. Talk about people and behaviors (or subjects and behavior).
 2. Highlight the hypotheses that were supported.
 3. Suggest reasons as to why some hypotheses were not supported (if relevant).
 4. Discuss the strengths and limitations of the study you report.
 - Focus on Measurement Validity, Internal Validity and the Various components of External Validity (Generalizability to the population, Mundane Realism (Ecological Validity), Experimental Realism, and/or Psychological Realism)
 5. Discuss how your results inform the psychological community with respect to the topic of research.
 6. Discuss suggestions for future research

7. Final statement needs to address how the present study affects our understanding of the universe and/or the condition of humans in the universe.

Example: (the numbers in parentheses in the text below are for your benefit, and should not be included in the text of your manuscript)

Discussion

(1) The present study tested the hypothesis that people who have greater hepatic and pancreatic secretion output would report more negative attitudes toward small furry animals and be more likely to demonstrate phobic responses to small furry animals. (2) Results support the hypothesis that hepatic secretions are associated with small furry animal phobia. However, little support was obtained for the hypothesis that pancreatic secretions are associated with fur-related phobias.

(3) This unexpected result can be interpreted in several ways. It may be that there truly is no link between insulin production and fear of small furry animals. Alternately, it may be that there is an association but the present study's design was not sensitive enough to identify the association due to a variety of potential factors. First, these findings may reflect sample problems. That is, the present study's focus on a college population severely limits the generalizability of the results. It may be that other, more stratified samples would show the predicted insulin - fur phobia link. Also, it has been noted that unique eating and drinking habits of college students can influence measures of insulin production (Budweiser, Miller, & Daniels, 1990). Second, the present study's use of nocturnal pancreatic emissions may not have been appropriate. It has been noted that metabolization of sugar is lowest during the sleeping hours (Hershey & Nestle, 1952). Use of daytime pancreatic secretions would be needed to adequately test this hypothesis. Third, neither the RABIT nor the Pit Sweat paradigm have been validated using other measures of small animal phobias. While they appear to have face validity, it may be that these measures only tap select aspects of fur phobia. This is important to the present study in that several researchers have noted that some animal phobics tend to show erratic and inconsistent phobic responses to the same stimulus (Sylvester, Granny, & Tweety, 1967). Such periodicity in phobic behavior may reflect the periodicity of pancreatic secretions. The design of the present study does not allow for the testing of this hypothesis.

(4) Though this study does suggest that hepatic secretions may be associated with animal phobia, causal links can not be established. An uncontrolled third variable may be confounding these results. For example, spleen size was not measured and controlled for in these analyses. Further, it may be that more psychological factors may be influencing these processes studied here, especially considering that several psychologists and biologists have commented on the connection between mind and body (Flinstone & Rubble, 1962; Mephisto & Kevin, 1999; Peabody & Sherman, 1968).

In conclusion, (5) the present study is important, in that it provides support that small furry animal phobia has its roots in organic tissues outside of the spleen, an idea that was pure speculation prior to these findings. (6) Future research should direct attention to both psychological and biological factors that influence small furry animal phobia. Also, future research may want to test more experimental designs. For example, regulating hepatic and insulin output through the use of randomly assigned treatment conditions. Such a line of research may make it possible to treat individuals who suffer from maladaptive levels of romantic animal phobia. (7) This line of research is crucial to developing our understanding of the dynamics of small furry animal phobia and developing public and mental health policies aimed at protecting our citizens from cute woodland creatures, which pose numerous threats to our culture and ecosystem.

– Note that the references would be included next, but are not presented in this guide.

Table 1

Crosstabulation of Sex and Diabetic Status

Classification	Diabetic Status		χ^2	<i>df</i>	Φ
	Diabetic	Not Diabetic			
Males	14.2% (1.98)	16.8% (-1.98)	10.03**	1	.29
Females	13.3% (-1.98)	68.7% (1.98)			

Note. ** = $p < .01$. Standardized Adjusted Residuals appear in parentheses below means

Table 2

Mean Pit Sweat Volume for Participants with High NATSFA Scores and Participants with Low NATSFA Scores, Separate for Each Stimulus Condition.

	Stimulus Type			<i>F</i>	η^2
	Caricature	Picture	Inanimate Object		
High NATSFA	37.00 _b (5.41)	36.00 _b (5.22)	3.00 _a (5.00)	10.04***	.26
Low NATSFA	3.00 _a (5.38)	3.00 _a (4.99)	3.00 _a (5.01)	0.01	.00

Note. $df = (2, 57)$ for both analyses. (** = $p \leq .01$). Means within rows with differing subscripts are significantly different at least $p \leq .05$ with respect to Fisher's LSD post hoc analyses.

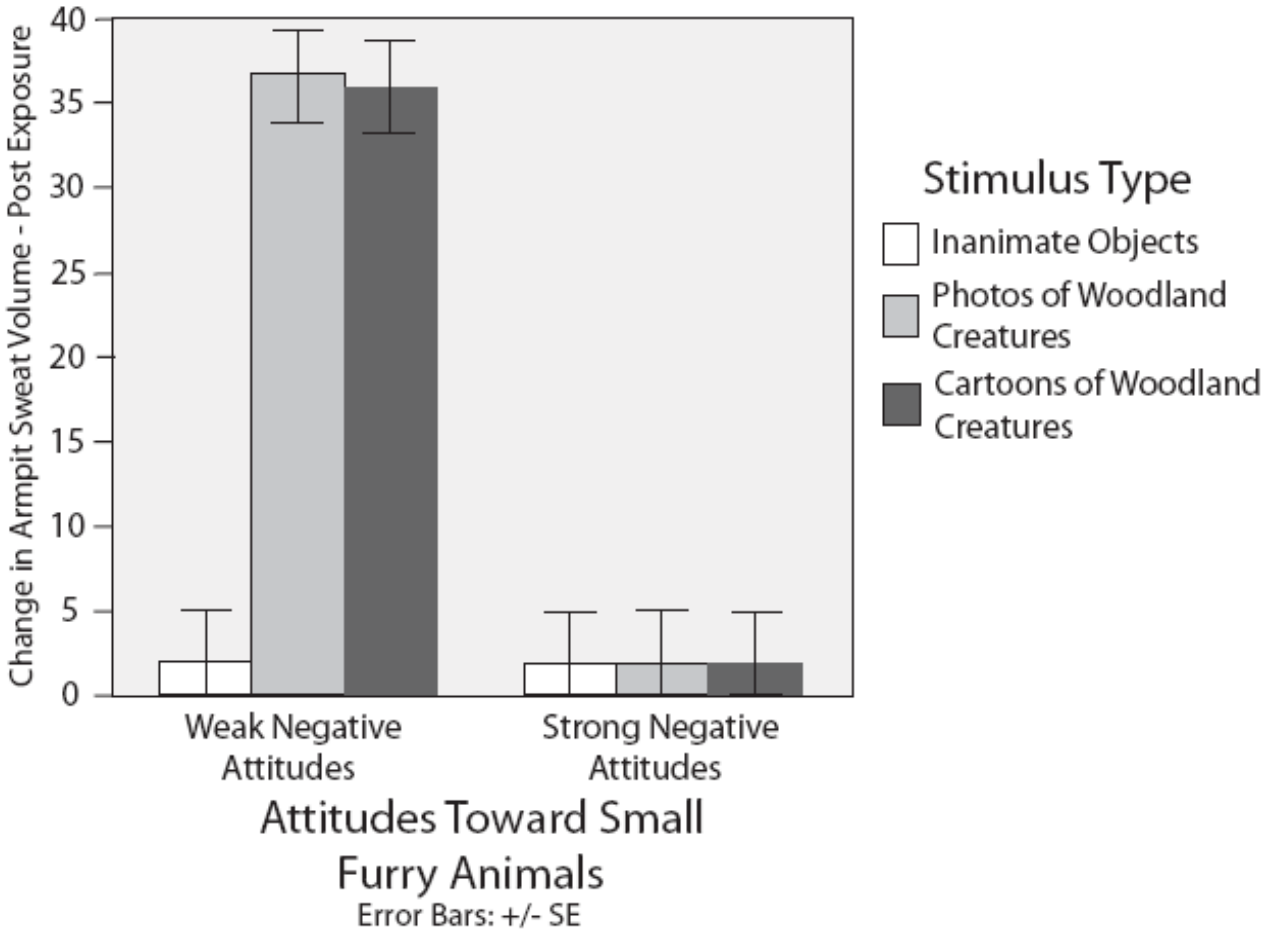
Table A1.

Mean Pit Sweat Volume for Participants with High NATSFA Scores and Participants with Low NATSFA Scores, Separate for Each Stimulus Condition (example of a Two-Way Interaction).

	Stimulus Type			$F_{\text{simple effect}}$ (η_p^2)
	Caricature	Picture	Inanimate Object	
High NATSFA	37.00 _b (5.41)	36.00 _b (5.22)	3.00 _a (5.00)	10.04 ^{***} (.10)
Low NATSFA	3.00 _a (5.38)	3.00 _a (4.99)	3.00 _a (5.01)	0.01 (.00)
$F_{\text{simple effect}}$ (η_p^2)	20.03 ^{***} (.19)	18.02 ^{***} (.17)	0.03 (.00)	

Note. * = $p \leq .01$, *** = $p \leq .001$. *df* for Stimulus Type simple effects = 2, 174. *df* for NATSFA simple effects = (1, 174). Means within rows with differing subscripts are significantly different at least $p \leq .05$ with respect to Fisher's LSD post hoc analyses. Post Hoc results for simple effects in columns are not displayed.

Figure A1. Change in armpit sweat volume after stimulus exposure for participants with strong negative attitudes toward small furry animals and participants with weak negative attitudes, separate for each visual stimulus condition.



Appendix

Example: Reporting the Results of a Two-way ANOVA with supporting data analysis plan.

Data Analysis Plan...

... AISFA A 2 (High vs. Low NATSFA) x 3 (Stimulus Type) factorial ANOVA will be used to test the effects of negative attitudes toward small furry animals and type of visual stimulus (inanimate objects, photos of small woodland creatures, or cartoons of woodland creatures) on the change in armpit sweat output volume after stimulus exposure. The factorial ANOVA will test the main effects of negative attitudes and stimulus type and the interaction between these variables. If the main effect of stimulus type is significant, it will be probed with Fishers's LSD t tests. A significant interaction will be probed with two sets of simple effects analyses. The first set of simple effects compares the armpit sweat change scores of the participants with strong negative attitudes toward small furry animals with the scores separately for participants with weak negative attitudes for each of the stimulus type conditions. The second set of simple effects separately compares the armpit sweat scores of the three stimulus type conditions separately for participants with strong negative attitudes toward small furry creatures and for participants with weak negative attitudes. Significant simple effects will be probed with Fisher's LSD t tests.

Results

... Also, It was hypothesized that higher self reports on the NATSFA subscale of the RABIT would be associated with greater amounts of pit sweating, but only when the visual stimulus depicted a small woodland creature. To this end, the pit sweating volume change of participants scoring above the mean on the NATSFA was compared with that of participants scoring below the mean (each group consisted of 60 participants) across the 3 stimulus conditions (Inanimate Objects, Animal Pictures, and Animal Caricatures). A 2 (High vs. Low NATSFA score) x 3 (Stimulus Condition) factorial ANOVA found significant main effect for both NATSFA score, $F(1, 174) = 5.58, p < .001, \eta^2 = .03$. Participants with more negative attitudes toward small furry animals scores showed more pit sweating than participants with more positive attitudes, with means and standard deviations of 25.33 (5.23) and -3.00 (5.01), respectively. Also, there was a significant main effect for the stimulus condition, $F(2, 174) = 6.67, p < .001, \eta^2 = .07$. Results of Fisher LSD post-hoc tests revealed that photographs and caricatures of small animals elicited more pit sweating than inanimate objects, with means and standard deviations of 20.00 (5.34), 19.5 (5.13), and -3.00 (5.22), respectively.

Finally, a significant interaction was found between the NATSFA score group and the stimulus type, $F(2, 174) = 20.20, p < .001, \eta^2 = .19$. Results of tests of simple effects revealed that participants with strong negative attitudes toward small furry animals showed more pit sweating in the caricature and photo conditions than in the inanimate object condition (See Table A1). Also, participants with weaker negative attitudes toward small furry animals did not differ in pit sweating across the three conditions. Further, Participants exposed to either the caricature or the photos with more negative furry animal attitudes demonstrated more pit sweating than participants reporting more positive attitudes. Finally, participants exposed to the inanimate objects who reported strong negative furry animal attitudes did not differ from participants reporting weaker negative attitudes. Figure A1 displays group means graphically.