Stress Reduction: Casual Gaming versus Guided Relaxation

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Abstract

Physiological and psychological stresses are gaining more interest as they are associated with many illnesses and diseases. The development of tools to reduce stress can help reduce the risk of illness and disease and improve treatment outcomes. Research has indicated that casual gaming can help reduce physiological and psychological stress. The present research investigates how casual gaming compares in the reduction of stress to guided relaxation and sitting quietly using a between subjects design. The results show that casual gaming can improve positive affect for mood more than meditation/guided relaxation and sitting quietly. These findings support prior research where casual gaming has been shown to increase mood and therefore may help to reduce stress.

Stress Reduction: Casual Gaming or Guided Relaxation

According to the Casual Gaming Association (2013), over 200 million people play casual video games worldwide and the industry generated nearly six billion in revenue in the year 2010. These games are played on several devices including cellphones, tablets, laptops, and desktops making them accessible to a wide variety of people in a wide variety of places.

Casual games are different from core or enthusiast games (Casual Gaming Association, 2007, 2013). Core games are usually targeted at a younger audience and incorporate cutting edge technology. They also typically require a large amount of time investment. In contrast, the majority of people who play casual games are women over the age of thirty. They are usually played for a relatively short period of time and can easily be resumed later. Casual games are typically nonviolent, arcade style games that require no prior video gaming experience or time commitment. Examples of casual games include: Mahjong, Tetris, Solitaire, Bejeweled, Mystery Case Files, Angry Birds, Candy Crush Saga, and Farmville (Casual Gaming Association, 2013).

It is the purpose of the present research to discuss and investigate the possible stress reducing effects of casual gaming in comparison to guided relaxation. Stress reduction is gaining more attention as research continues to show the negative effects stress can have on physical and mental wellbeing (Cohen, Janicki-Deverts, & Gregory, 2007). Stress has been shown to help cause or exacerbate several illnesses or diseases including cardiovascular disease, diabetes, and depression (Cohen, Janicki-Deverts, & Gregory, 2007; Huang, Webb, Zourdos, & Acevedo, 2013; Thayer & Sternberg, 2006). It can interfere with treatment outcomes for many illnesses such as HIV/AIDS (Cohen, Janicki-Deverts, & Gregory, 2007). Stress has also been correlated with many behaviors that increase the risk of serious illness such as smoking cigarettes, trouble

sleeping, lack of exercise, and a decrease in medical care. By providing new and innovative ways for people to reduce stress, the risks for physical and mental illness may be reduced.

Recent research has shown that casual video gaming may help to reduce stress. In Reinecke's 2009 study, he provides a concept for recovery of stress involving four distinct parts: psychological detachment, physiological relaxation, mastery experiences, and perceived control. He uses these four aspects of stress reduction to theoretically show that video and computer games have the capabilities of reducing stress and aiding in the recovery process.

According to Reinecke (2009), the active participation demanded by the game reduces the ability for players to ruminate on unwanted thoughts and stressful events. This provides the psychological detachment that can reduce stress.

The physiological relaxation provided by video gaming varies widely between games and is not always an accurate depiction of stress reduction (Reinecke, 2009). He notes that exercise is often associated with reduced stress and, counterintuitively, with heightened physical arousal. This would suggest that although physiological relaxation can help reduce stress, it may not be necessary for stress reduction to take place.

Gaming can provide a means for some people to achieve mastery experiences (Reinecke, 2009). When levels are completed or awards are earned in the game, a sense of achievement can follow. Many games allow for competitions between other gamers. This can increase a sense of mastery when the gamer is performing well, however, it can also provide a source of stress when the gamer is performing poorly.

Perceived control can increase when playing a video or computer game because outcomes of the game often largely depend upon the decisions of the gamer (Reinecke, 2009).

The actions of the gamer directly determine the course of the game and provide the player with a direct sense of control over the situation.

In addition to his theoretical approach to gaming as a means of stress reduction, he also conducted an online survey consisting of 1614 participants (Reinecke, 2009). His results showed that participants often associate gaming with stress relief. In addition, the amount of work-related fatigue and daily hassles a participant reported were significant predictors of how often video or computer games were played for stress relieving benefits.

Casual games were largely underrepresented in Reinecke's research (Reinecke, 2009). However, similar findings regarding the perceived stress relief of gaming were found in an online consumer profile published in the Casual Games Market Report (Casual Games Association, 2007). They reported that stress relief was the number one reason participants gave for playing casual games.

In another research study, three casual video games were tested for their effects on mood as measured by a self-report questionnaire and physiological changes measured with an electroencephalogram (Russoniello, O'Brien, and Parks, 2009). Data was analyzed for 134 participants. The findings of this study show that casual gaming had a positive impact on mood and brain function. A decrease in heart rate was found for two of the three gaming conditions. Although the three different games affected the players in markedly different ways, the end result was interpreted as a reduction in stress for all three conditions.

Unpublished research from the University of Central Florida presented at the Human Factors and Applied Psychology Conference compared the effects of casual gaming, relaxation, and sitting quietly (control condition) on mood, distress, worry, and engagement (Sweetman, Sosa, Simon, Rupp, & McConnell, 2014). The PANAS mood scale test and The Dundee Stress

State Questionnaire (DSSQ) were used for pre and posttest measurements and a stress inducing task was administered at the beginning of the experiment. The analysis included measurements from 65 participants. They found that casual video games were just as effective as relaxation in reducing distress and worry and more effective at engaging the participant. Both conditions were more effectiveness at reducing distress and worry and increasing positive affect on mood and engagement than the control condition.

Meditation and guided relaxation are widely accepted methods for reducing stress. Meditation techniques are taught in many settings such as pain management, Clinical tools for anxiety and stress reduction, test anxiety reduction, and many more. Research has shown the effectiveness of meditation/guided relaxation at reducing stress (Souders, Yordon, Hamilton, & Charness, 2010). Because meditation and guided relaxation are widely accepted forms of stress reduction, it is reasonable to compare them with casual video gaming. If casual video gaming shows similar results as meditation/guided relaxation, it would help validate its usefulness as a form of stress reduction.

The prior research presented indicates that casual video gaming can be an effective means of reducing stress. For the present research, casual video gaming is compared to meditation/guided relaxation and to a control condition in which participants were asked to sit quietly. This study builds on prior research by combining physiological measures and psychological measures to investigate the possible stress reducing effects of casual gaming and meditation/guided relaxation.

First, it was hypothesized that the casual video gaming condition and the meditation/guided relaxation condition would be similar and show a greater increase in positive affect and a greater decrease in negative affect than the control condition as measured by the

PANAS mood scales. This would support the outcomes of previous research showing the positive effects gaming can have on mood (Reinecke, 2009; Russoniello, O'Brien, & Parks, 2009; Sweetman, Sosa, Simon, Rupp, & McConnell, 2014).

Second, it was hypothesized that the casual video gaming condition and the meditation/guided relaxation condition would be similar and show a greater increase in perceived control and confidence than the control condition as measured by the DSSQ. This would support the outcomes predicted by the perceived control and mastery experiences factor theorized in previous research (Reinecke, 2009).

Third, it was hypothesized that the casual video gaming condition and the meditation/guided relaxation condition would be similar and show a greater decrease in physiological arousal than the control condition as measured by heart rate and blood pressure. This finding would be consistent with prior research (Reinecke, 2009; Russoniello, O'Brien, & Parks, 2009).

Methods

The purpose of this research is to show how casual gaming compares to meditation/guided relaxation and to a control group on stress reduction. This is done by using valid psychological and physiological measures to measure changes in physiological arousal, mood, and perceived control and confidence.

Participants

Fifty five (n = 55) participants were recruited for the study and fifty one (n = 51) were included in the data analysis. Four participants were excluded with two participants ending the study early and two participants experiencing equipment malfunctions with the blood pressure cuff. Sixteen (n=16) participants were assigned to the gaming condition, seventeen (n=17)

participants were assigned to the meditation/guided relaxation condition, and eighteen (n=18) participants were assigned to the sitting quietly (control) condition. All participants were tested over a sixteen-day time period from October 20, 2014 to November 4, 2014.

Amongst the participants, there were 39 females and 12 males with the average age of participants being 25 years. Participants consisted of college students recruited from psychology classes offering extra credit for participation in research. Participants consisted of 14 freshman, 11 sophomores, 14 juniors, and 12 seniors.

Procedures

All participants read and signed a consent form prior to their participation in the study. The study was conducted in a psychology lab where identical testing rooms were provided to the participants. The participants were instructed to leave personal belongings outside of the testing area and to turn their cell phones off.

The participants began the study by completing an N-back working memory task on a computer for 5 minutes. This task was used to induce stress in the participants and required the participants to view 8-digit numbers for approximately 3 seconds and then respond to questions about what number was located in a particular position. For example, the number 47613215 was presented on the computer screen for 3 seconds, followed by a fixation screen. The participant was then asked what number was in the fifth position. The participants were never asked to report the first or last number in the sequence. Feedback was given to the participants immediately after each question indicating whether they answered correctly or incorrectly. Research has shown working memory tasks, such as the N-back task, are an effective tool for inducing stress (Matthews & Campbell, 2009, 2010; Matthews, Campbell, Falconer, Joyner,

Huggins, Gilliland, Grier, & Warm, 2002; Matthews, Emo, Funke, Zeidner, Roberts, Costa, & Schulze, 2006).

Immediately following the stress inducing task, the participant's heart rate and blood pressure was recorded and the participants filled out a pre-test for the PANAS Mood Scales and the DSSQ.

At this point, one of the three experimental conditions was administered. The participants were asked to play a casual game, watch a meditation/guided relaxation video, or sit quietly for 5 minutes. The casual game was administered on a Nextbook, seven inch tablet. The game used in this research is called Jewels Deluxe and is similar to Bejeweled II (Sunfoer Mobile, n.d.). It was chosen for this study instead of Bejeweled II because it allowed for uninterrupted game play and did not contain any competitive features.

Participants in the meditation/guided relaxation condition where asked to watch a video on a computer for 5 minutes. The video used in this study guided the participant in meditation (TheHonestGuys, 2011). The background of the video consisted of ocean waves and sounds. These attributes have been named in previous research for their effectiveness in reducing stress (Souders, Yordon, Hamilton, & Charness, 2010).

After the condition was administered, the participant's physiological arousal was measured again and the post-tests for the PANAS Mood Scales and the DSSQ were administered. Following the study, participants were asked to complete a demographics questionnaire.

Physiological and Psychological Measures

Physiological measurements were taken using a blood pressure cuff. Heart rate and blood pressure were recorded before and after the experimental conditions were administered. Heart

rate and blood pressure have been used in many scientific research studies as a means of measuring physiological arousal as a response to stress (Dulmen, Tromp, Grosfeld, Cate, & Bensing, 2007; Reinecke, 2009; Russoniello, O'Brien, & Parks, 2009).

The PANAS mood scales are a self-report measure of positive and negative affect (Watson, Clark, and Tellegen, 1988). Positive and negative affect are broad, independent states that can range from low levels to high levels. The scale consists of 20 words, 10 words indicating positive affect and 10 words indicating negative affect. The participants were asked to indicate, on a scale of 1 to 5, 1 being very slightly or not at all and 5 being extremely, how the word best describes their current feelings. This measurement was taken before and after the experimental condition for each participant and a difference score was computed for both positive and negative affect.

The PANAS mood scales have been validated and are widely used in research (Merz, Malcarne, Roesch, Ko, Emerson, Roma, & Sadler, 2013; Watson, Clark, & Tellegen, 1988). A short form of the scale has been produced and validated however; the original scale was used in this study (Merz, Malcarne, Roesch, Ko, Emerson, Roma, & Sadler, 2013). It has been shown that the scale is sensitive enough to detect differences in positive and negative affect for individual tasks (Sweetman, Sosa, Simon, Rupp, & McConnell, 2014; Watson, Clark, & Tellegen, 1988).

The Dundee Stress State Questionnaire (DSSQ) was used in the present research to measure changes in perceived control and confidence. This self-report measure is multidimensional (Matthews, Joyner, Gilliland, Campbell, Falconer, & Huggins, 1999, Matthews, Szalma, Panganiban, Neubauer, & Warm, 2013). It measures subjective states

associated with stress, arousal, and fatigue. The participants in this study filled out the DSSQ in full, however; only the scales of control and confidence were used in the data analysis.

The DSSQ has been used in several studies to investigate the effects of stress inducing or relieving tasks (Matthews & Campbell, 2009; Sweetman, Sosa, Simon, Rupp, & McConnell, 2014; Temple, Warm, Dember, Jones, LaGrange, & Matthews, 2000). It has been shown to be a valid means of investigating the stress reducing properties of specific tasks.

Results

After the data had been collected, difference scores were calculated for measurements of heart rate, systolic blood pressure, and diastolic blood pressure, for the PANAS scales of positive and negative affect, and for the DSSQ scale of control and confidence. An Analysis of Variance (ANOVA) was used to analysis the data. Refer to Table 1. for additional descriptive statistics.

Hypothesis 1

The first hypothesis predicted that the casual video gaming condition and the meditation/guided relaxation condition would be similar and show a greater increase in positive affect and a greater decrease in negative affect than the control condition.

The results showed a significant difference between conditions indicating that casual video gaming increased positive affect for mood more than meditation/guided relaxation and the control condition. The results were as follows: $f\,(2,45) = 4.014$, $p = 0.025$. For the casual gaming condition, $m = 0.69$ with a standard deviation of 5.84. For the meditation/guided relaxation condition, $m = -5.24$ with a standard deviation of 6.51. For the sitting quietly (control) condition, $m = -4.78$ with a standard deviation of 6.44. The effect size for the significant difference found was small, $\eta^2 = 0.151$.

The results did not support the hypothesis that casual video gaming would be similar to meditation/guided relaxation and that both would increase positive affect for mood more than the control condition. The results indicated that casual gaming increased positive affect more than meditation/guided relaxation and the control condition.

The results showed no significant differences between casual video gaming, meditation/guided relaxation, or sitting quietly in the reduction of negative affect for mood. The results were as follows: $f(2,45) = .248$, $p = .78$. For the casual gaming condition, $m = -1.88$ with a standard deviation of 3.24. For the meditation condition, $m = -2.59$ with a standard deviation of 3.14. For the sitting quietly (control) condition, $m = -1.44$ with a standard deviation of 4.9.

These results supported the hypothesis that casual video gaming and meditation/guided relaxation would be similar in decreasing negative affect for mood but they do not support the hypothesis that casual video gaming and meditation guided relaxation would decrease negative affect more than the control condition. Refer to Figure 1. for a graphical representation of the difference score means for positive and negative affect.

Hypothesis 2

The second hypothesis predicted that the casual video gaming condition and the meditation/guided relaxation condition would be similar and show a greater increase in perceived control and confidence than the control condition.

The results indicated no significant differences in perceived control and confidence between casual video gaming, meditation/guided relaxation, or sitting quietly. The results were as follows: $f(2,45) = 2.33$, $p = 0.11$. For the casual gaming condition, $m = -2.5$, with a standard deviation of 5.13. For the meditation/guided relaxation condition, $m = 2.35$ with a standard

deviation of 7.31. For the sitting quietly (control) condition, m = -0.11, with a standard deviation of 5.16.

These results support the hypothesis that casual video gaming would be similar to meditation/guided relaxation in increasing perceived control and confidence. The hypothesis that casual video gaming and meditation/guided relaxation would increase perceived control and confidence more so than the control condition was not supported.

Hypothesis 3

The third hypothesis predicted that the casual video gaming condition and the meditation/guided relaxation condition would be similar and show a greater decrease in physiological arousal than the control condition.

The results indicated no significant differences between casual gaming, meditation/guided relaxation, or sitting quietly in the reduction of heart rate, systolic blood pressure, or diastolic blood pressure. For heart rate, the results were as follows: Wilks' Lambda = 0.971, f (3,43) = 0.43, p = 7.29. For systolic blood pressure, the results were as follows: Wilks' Lambda = 0.986, f (3,43) = 0.199, p = 0.9. For diastolic blood pressure the results were as follows: Wilks' Lambda = 0.964, f (3,43) = 0.542, p = 0.66.

These results support the hypothesis that casual video gaming would be similar to meditation/guided relaxation in reducing physiological arousal. The results do not support the hypothesis that casual video gaming and meditation/guided relaxation would decrease physiological arousal more than the sitting quietly (control) condition.

Discussion

Our results showed that casual video gaming is similar to meditation/guided relaxation in its effects on physiological arousal, perceived control and confidence, and negative affect for

mood. The only exception was increased positive affect for mood. This finding supports our predictions that casual video gaming should be similar to meditation/guided relaxation if it is a possible means by which to reduce stress.

Although the effect size is small, the significant difference found for positive affect indicates that casual video gaming was more effective at improving positive affect for mood than meditation/guided relaxation or sitting quietly. This finding in consistent with prior research (Russoniello, O'Brien, & Parks, 2009; Sweetman, Sosa, Simon, Rupp, & McConnell, 2014). An increase in positive affect for mood as a result of casual game play also lends support to Reinecke's (2009) theorized predictions for video gaming which he attributes to an increase in psychological detachment provided by gaming.

Casual video gaming and meditation/guided relaxation did not show significant differences from the sitting quietly (control) condition which was hypothesized, with the exception of increased positive affect. This does not support prior research in which casual video gaming was shown to have lowered physiological arousal, increased perceived control and confidence, and lowered negative affect for mood (Russoniello, O'Brien, and Parks, 2009; Sweetman, Sosa, Simon, Rupp, & McConnell, 2014). It also does not support the prior research showing that meditation/guided relaxation reduce physiological arousal, decrease negative affect for mood, and increase positive affect for mood (Souders, Yordon, Hamilton, and Charness, 2010).

Limitations

This research was unable to obtain the results of previous work. This could be due to several factors. For instance, the effect size could be very small and require a large amount of

participants to be included in the analysis in order to see a significant difference. To test this potential confound, future research should analyze data from a larger amount of participants.

It is also possible that our measures were not sensitive enough to pick up small differences. For example, previous research was able to show a significant difference in physiological arousal for casual gaming with the use of an electroencephalogram (Russoniello, O'Brien, & Parks, 2009). These differences may have been too small for our research to document using a blood pressure cuff. Future research should make use of more sensitive measuring devices.

The casual game that was used in this study may not have the same stress reducing effects as other casual games. Research has shown different casual games to have different and varying results on measures of stress and mood (Russoniello, O'Brien, & Parks, 2009). In future research, this casual game should be compared to other casual games to investigate what differences might exist. The same statement can be made for meditation/guided relaxation due to the prior research that has demonstrated how different meditation/guided relaxation techniques can have different effects on physiological and psychological measurements (Souders, Yordon, Hamilton, & Charness, 2010).

Another possible limitation of this research involves the amount of time given for each participant to participate in the condition. The five minutes given to the participants to play the casual video game, watch the meditation/guided relaxation video, or sit quietly may not have been enough to generate a large enough effect on the measured variables to yield a significant result. Future research should test the effects of time on the conditions investigated.

The stress-inducing task used to increase stress in the participants may not have been effective enough to show significant results. To control for this factor, future researchers should

run a pilot study to determine if the stress-inducing task is resulting in an adequate amount of stress. Although research shows that the N-back task causes stress in participants, the five minute task may need to be lengthened (Matthews & Campbell, 2009, 2010; Matthews, Campbell, Falconer, Joyner, Huggins, Gilliland, Grier, & Warm, 2002; Matthews, Emo, Funke, Zeidner, Roberts, Costa, & Schulze, 2006).

It is also possible that the terminology used in the psychological assessments was difficult to read and distracting to the participants. Terms such as "unenterprising" and "muscular tension" were used in the assessment and could be difficult for some participants. It is also possible that the length of the assessments used could have impacted the results by increasing stress, frustration, or fatigue in the participants. To control for these possible confounds, future research should consider using the short form of the PANAS and/or DSSQ . The reading level of the participant should also be controlled for so that complicated words and phrases do not affect the results.

Conclusions

Despite the limitations and small effect size, a significant difference in positive affect for mood was documented. This provides evidence that casual gaming can improve mood and help reduce stress. Given the large amount of diseases and illnesses stress has been linked to, the ongoing research and development of stress reducing tools is important. If future research continues to show that casual gaming can have a stress reducing effect, it may provide a cost effective way of providing stress relief that can be easily obtained and used in a variety of situations and locations.

Future Questions

Questions in need of further research include how participant characteristics affect the stress-reducing capabilities of casual gaming such as age, sex, education level, or marital status. It is unknown whether familiarity with casual gaming over time affects the possible stress-reduction of casual games. Future research should investigate this variable. In addition, the potential real world settings in which casual gaming could be implemented as a stress reducer should be investigated and incorporated into future research.

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Table 1.

Casual Gaming, Meditation, and Sitting Quietly: Comparing Results

	DSSQ – Control and Confidence		**PANAS – Positive Affect**		**PANAS – Negative Affect**	
	M	**SD**	**M**	**SD**	**M**	**SD**
Sitting Quietly	-0.11	5.16	-4.78	6.44	-1.44	4.9
Meditation	2.35	7.31	-5.24	6.51	-2.59	3.14
Casual Gaming	-2.5	5.13	0.69	5.84	-1.88	3.24

Note. Listed above are the descriptive statistics for difference scores of the psychological measurements taken before and after the experimental and control conditions. The DSSQ is the Dundee Stress State Questionnaire and was used to test for changes in perceived control and confidence for each of the conditions. The PANAS mood scale was used to test for changes in positive and negative affect for mood.

Figure 1.

Comparing Means for the PANAS Mood Scales

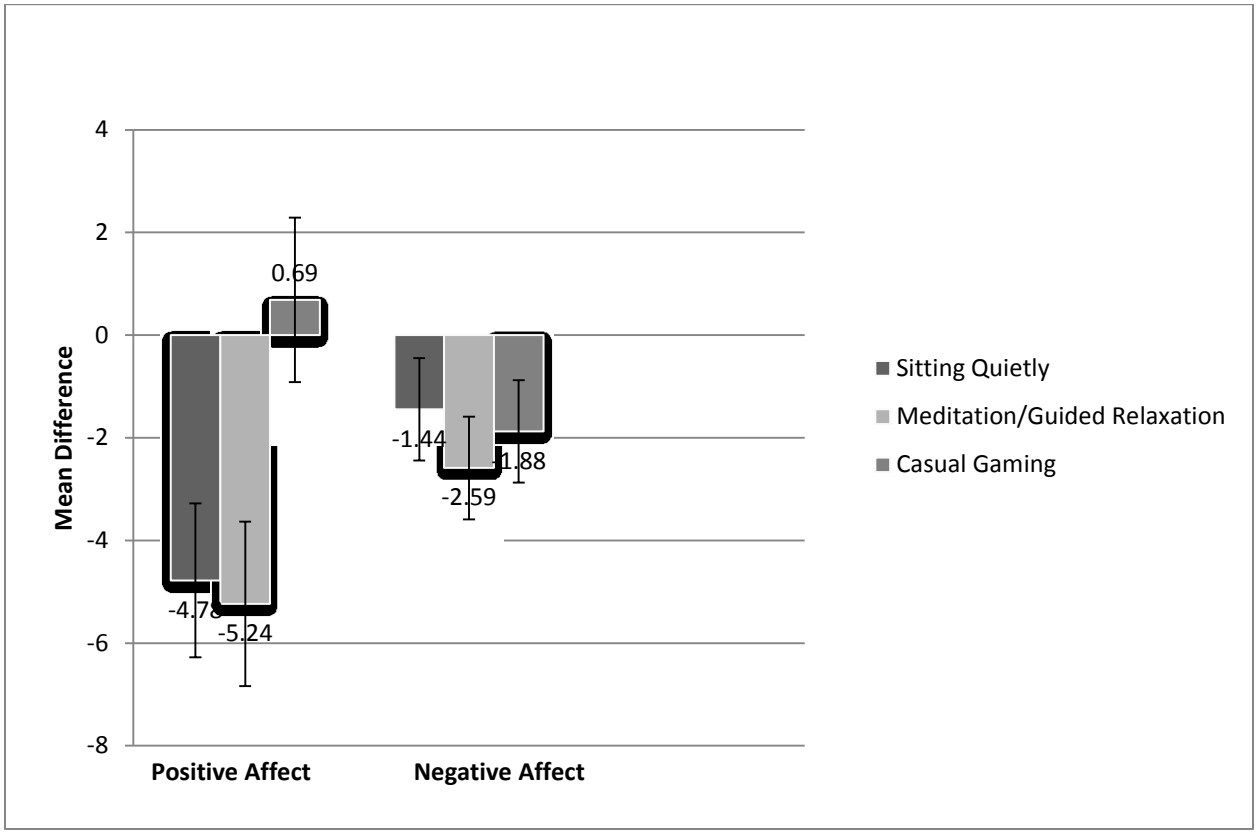

Figure 1. Difference score means for the PANAS mood scales. Positive affect and negative affect were measured before and after the condition was administered to participants and a difference score was computed. An ANOVA indicated that a significant difference existed for positive affect but not for negative affect. Error bars represent standard error.