IMPACT OF STRENGTHS INTERVENTIONS ON STRENGTHS USE, PERFORMANCE, AND FLOURISHING AMONG EMPLOYEES

by

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Abstract

Character strengths are positive personal traits associated with desirable work-related outcomes. However, relatively few intervention studies have examined the impact of using character strengths in the workplace. This study sought to contribute further knowledge to this topic area by examining if character strengths interventions improve strengths use, job performance, and flourishing at work for full-time employees, ages 18-65. Specifically, whether using top strengths had more impact than using bottom strengths or a combination of top and bottom strengths. The study used a longitudinal, experimental approach. There were two independent variables: time and group. The independent variable of group had four levels: a placebo-control group and three different treatment groups (i.e., top strengths, bottom strengths, combination of top and bottom strengths). Participants were randomly assigned to one of the four groups for a 2-week intervention. The three dependent variables (i.e., strengths use, job performance, and flourishing at work) were measured at three time intervals: baseline (preintervention), first posttest (immediately following the intervention), and second posttest (4 weeks after the intervention). Three research questions were investigated for each of the dependent variables: "Is there a statistically significant interaction effect between group and time? Is there a statistically significant difference between time points? Is there a statistically significant difference between groups?" A two-way mixed analysis of variance (ANOVA) was performed for each dependent variable. There was no significant interaction effect of group and time. Additionally, there were no significant findings for the main effects of time and group. The only exception was a significant result for job performance for the main effect of time, which was an increase in mean scores from the baseline to first posttest. Post hoc analysis was performed by creating three new groups based on participants' change in strengths use scores from baseline to first posttest.

Groups that increased at least minimally in strengths use from baseline to first posttest also significantly increased in job performance. However, there was no significant increase in flourishing at work from baseline to first posttest across these groups. The study findings were inconclusive but instructive, suggesting that change in strengths use can impact outcomes. Further investigation is needed to bring more clarity to the issue of whether it is more beneficial to use top or bottom strengths at work.

Dedication

This dissertation is dedicated to my family. My deepest gratitude and appreciation go to my husband, Rich Bond. He has always been my greatest supporter and cheerleader in all my endeavors, and this doctoral journey was no exception. He provided inspiration during the tough times and celebration at every milestone. From the moment I decided to pursue my PhD, through all the coursework, comprehensive exams, and finally, the dissertation process, he was by my side, rooting for me. Thank you, honey, for believing in me every step of the way, even when I did not. Thanks and love also go to my pack, Sunny and Glory, who spent endless hours by my side as I worked on this manuscript. You will always be the best canine co-workers. Lastly, I am grateful to my parents, brother and sister-in-law, and friends for their care, support, and encouragement.

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CHAPTER 1. INTRODUCTION

Character strengths are positive personal traits associated with desirable work-related outcomes (Miglianico et al., 2020). The dissertation topic was the impact of character strengths interventions on strengths use, job performance, and flourishing at work. Character strengths were identified by the field of positive psychology (Peterson & Seligman, 2004) and have been studied in various life domains, including the workplace (Miglianico et al., 2020; Schutte & Malouff, 2019). Some examples of character strengths include curiosity, prudence, gratitude, leadership, social intelligence, and honesty (Peterson & Seligman, 2004). An example of a character strengths intervention would be for participants to identify their top strengths by taking the Values in Action (VIA) Character Strengths Survey (VIA Institute on Character, 2021a) and using one of those top strengths in a new way each day for 1 week (Seligman et al., 2005). Thus, the dissertation topic examined the effectiveness of character strengths interventions in an organizational context. This chapter provides an overview of the study, including the research problem, statement, and background. Additionally, the purpose and significance of the study are examined, followed by the research questions, definition of terms, and an outline of the research design. Finally, the study's various assumptions and limitations are reviewed.

Background of the Problem

The research problem addressed was whether character strengths interventions effectively improve strengths use, job performance, and flourishing at work for full-time employees, ages 18-65. As background for the research problem, this section examines the origin of character strengths, research related to character strengths in the workplace context, the practical application of character strengths through the use of interventions, and the theoretical framework that guided the study.

Character Strengths

Character strengths are positive personal traits that benefit the self and others (Niemiec, 2018). Researchers in the positive psychology discipline defined the strengths to provide a framework for the movement as it emerged around the turn of the 21st century (Bretherton & Niemiec, 2018). Based on a multi-year effort by several social scientists, Peterson and Seligman (2004) distinguished six ubiquitous virtues evident across countries, religions, and cultures (wisdom, courage, humanity, justice, temperance, and transcendence). These virtues were further divided into 24 character strengths considered to be the components or processes that define the virtues. Although some researchers have challenged whether character strengths are universal (Kinghorn, 2017), an analysis of over one million adults across 75 nations revealed significant convergence in character strengths identification across cultures (McGrath, 2015a), suggesting that they are indeed globally consistent. Additionally, studies have demonstrated that the use of character strengths is correlated with positive outcomes, including greater happiness (Seligman et al., 2005; Schutte & Malouff, 2019), life satisfaction (Buschor et al., 2013; Schutte & Malouff, 2019), well-being (Harzer, 2016), and flourishing (Hone et al., 2015), and decreased depressive symptoms (Schutte & Malouff, 2019; Seligman et al., 2005). Thus, a substantial amount of research has furthered the understanding and application of character strengths. However, much is still unknown, particularly in the workplace context.

Character Strengths in the Workplace

The study of character strengths in the workplace has yielded a range of findings. For example, character strengths have been identified as a "driver" of employee engagement (Crabb, 2011) and strengths use at work was positively correlated to well-being and more meaning (Littman-Ovadia & Steger, 2010), productivity, organizational citizenship behavior (OCB), job

satisfaction (Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010), creativity (Avey et al., 2012; Kalyar & Kalyar, 2018), and performance (Bakker & van Woerkom, 2018). Positive work experiences and regarding work as a primary life purpose was greater when four to seven top strengths were used at work (Harzer & Ruch, 2012), and character strengths were positively connected to coping at work and buffering the effects of work-related stress on job satisfaction (Harzer & Ruch, 2015). By contrast, the lack of opportunities to use character strengths on a daily basis was related to employees experiencing strain at work (Merritt et al., 2018). While this evidence has contributed to academic knowledge of character strengths, only a few studies have investigated the practical application of character strengths interventions in the workplace.

Character Strengths Interventions

Character strengths workplace intervention studies point to potential benefits for employers and employees, yet more knowledge is needed for optimal deployment. Dubreuil et al. (2016) found that employees reported greater strengths use and levels of well-being following a character strengths intervention. Other studies indicated an increase in work engagement, job performance (Peláez et al., 2020), employee positive affect, and psychological capital (Meyers & van Woerkom, 2017) following character strengths interventions. In another investigation, participants reported higher levels of global life satisfaction and perceiving work as a calling after an intervention to increase the use of their top four character strengths in the workplace (Harzer & Ruch, 2016). While this finding suggested that an intervention intended to increase top strengths use may support favorable work-related outcomes, another unpublished employee intervention study revealed little difference in results between groups assigned to focus on top strengths versus bottom strengths (Walker, 2013).

Indeed, not much is known about the impact of using top versus bottom strengths. Two studies examined the use of top and bottom strengths in a nonworking context and found little difference in outcomes. Rust et al. (2009) found no significant difference in life satisfaction among students who were asked to focus on using top strengths compared with those asked to use both top and bottom strengths. Similarly, in a general population study, Proyer et al. (2015) showed significant increases in happiness and decreases in depressive symptoms for up to 3 months in a group assigned to use top strengths as well as in a group assigned to use bottom strengths. Thus, in general, character strengths workplace intervention studies have provided some guidance on the impact of strengths use. However, there was a lack of understanding related to whether interventions should focus on employees developing their top strengths, bottom strengths, or both.

Theoretical Foundations

The theoretical foundation for the research topic was the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001), which is well-established in the field of positive psychology (e.g., Lyubomirsky, King, & Diener, 2005; Lyubomirsky & Layous, 2013; Mongrain & Anselmo-Matthews, 2012; Seligman, 2011). The broaden-and-build theory (Fredrickson, 1998, 2001) states that, unlike negative emotions that narrow an individual's thought-action response, positive emotions broaden in-the-moment cognitive-action resources, and repetition of these experiences builds an individual's physical, mental, and interpersonal resources over time. Thus, as an individual experiences frequent positive emotions, capability and performance are enhanced. As such, the theory has been used to predict and explain the outcome of several positive psychology interventions (PPIs) (e.g., Lyubomirsky, King, & Diener, 2005; Parks & Layous, 2016). Therefore, because character strengths interventions are a specific type of PPI

(Seligman et al., 2005), Fredrickson's broaden-and-build theory was suitable for the research topic.

The broaden-and-build theory (Fredrickson, 1998, 2001) provided an appropriate theoretical framework for the research topic because it guided predictions for the outcome variables of job performance and flourishing at work. For instance, character strengths have long been considered a pathway to well-being and flourishing (Seligman, 2011). Additionally, performance may be related to character strengths per the happy/productive worker concept (Lyubomirsky, King, & Diener, 2005; Staw, 1986; Wright & Staw, 1999). Moreover, in line with the broaden-and-build theory (Fredrickson, 1998, 2001), positive affect has been identified as a mediator between strengths use and favorable work-related outcomes (e.g., Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017; Meyers & van Woerkom, 2017; Quinlan et al., 2012; van Woerkom & Meyers, 2015). Consequently, Fredrickson's (1998, 2001) broaden-and-build theory offered a helpful framework for predicting and potentially explaining the outcome of character strengths interventions in the workplace.

Statement of the Problem

The research problem addressed was whether character strengths interventions are effective in improving strengths use, job performance, and flourishing at work for full-time employees, ages 18-65. Specifically, whether focusing an intervention on the use of top strengths has more impact than focusing on the use of bottom strengths, or a combination of top and bottom strengths. Top and bottom strengths are identified when an individual takes the VIA character strengths assessment (VIA Institute on Character, 2021a) and receives a personalized report ranking all 24 character strengths. Top strengths, also referred to as signature strengths, are the three to seven top-ranking strengths that "a person owns, celebrates, and frequently

exercises" (Peterson & Seligman, 2004, p. 18). Bottom strengths, also called lesser strengths, are the three to seven lowest-ranking strengths that an individual expresses or uses to a lower degree (Proyer et al., 2015). While numerous studies have identified positive correlations between character strengths use and desired work-related outcomes (e.g., Allan et al., 2019; Avey et al., 2012; Dubreuil et al., 2014; Harzer et al., 2017; Moradi et al., 2014), only a few have examined the practical application of strengths in the workplace. Indeed, most character strengths intervention studies have focused on the general population or student audiences and have measured the impact of the intervention on constructs such as life satisfaction, happiness, positive affect, and depression (Ghielen et al., 2018; Quinlan et al., 2012; Schutte & Malouff, 2019). Thus, there was a lack of knowledge regarding the impact of character strengths interventions in the workplace.

Additionally, only a few intervention studies have examined the effectiveness of using top versus bottom strengths, or a combination of both (e.g., Meyers et al., 2015; Proyer et al., 2015; Rust et al., 2009; Walker, 2013), and only one of these was conducted in the workplace context, though not published (Walker, 2013). There was little difference in outcome in each study regardless of the type of strengths participants were asked to use. However, none of these studies examined the impact of the interventions on strengths use, job performance, or flourishing at work. Moreover, there have been several calls for further research to understand better the effect of different strengths interventions on workplace-related outcomes (e.g., Dubreuil et al., 2016; Forest et al., 2012; Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Lavy, 2016; Peterson et al., 2010). Consequently, the research problem was that there were gaps in the literature concerning the effectiveness of different character strengths interventions on

strengths use, job performance, and flourishing in the workplace, specifically regarding the use of top strengths, bottom strengths, or a combination of both.

Purpose of the Study

The study of strengths use in the workplace is not new, but industrial/organizational (I/O) psychology researchers and practitioners still have much to learn concerning the impact of strengths interventions. Indeed, strengths in organizations have been studied since the 1950s (Hodges & Asplund, 2010). There is evidence that it is more beneficial to encourage employees to focus on strengths development rather than improving weaknesses (e.g., Buckingham & Clifton, 2001; Rath & Conchie, 2009). However, there is also recognition that a singular focus on strengths or overuse of strengths can have adverse consequences (Grant & Schwartz, 2011; Kaiser & Overfield, 2011; Niemiec, 2018), and that more research is needed to understand the effect of interventions that address strengths-only, deficits-only, or a combination of strengths and deficits (Biswas-Diener et al., 2017). Consequently, this study aimed to contribute to the knowledge base of using strengths interventions in the workplace.

The objective of this study was to answer the question, do character strengths interventions significantly impact levels of strengths use, job performance, and flourishing at work among full-time employees, ages 18-65? In answering this question, the study attempted to address the research problem that there was limited knowledge of the impact of character strengths interventions in the workplace, and only one study to date, which is unpublished (Walker, 2013), has examined whether it is more beneficial to focus on developing top or bottom strengths at work. As such, the current study responded to the call from I/O psychology researchers and practitioners (e.g., Biswas-Diener et al., 2017) for more data on whether

employee development should be focused on enhancing strengths, improving deficits, or a combination of both.

Significance of the Study

The dissertation topic was an important area of investigation for the fields of I/O psychology and positive psychology. It was significant for I/O psychology because the applied research could deliver benefits to both employers and employees. Specifically, in the workplace, character strengths use has been correlated with increased work performance (Harzer & Ruch, 2014), job satisfaction, OCB, productivity (Lavy & Littman-Ovadia, 2017), well-being, meaning at work (Littman-Ovadia & Steger, 2010), and engagement (Littman-Ovadia et al., 2017). These findings are particularly relevant for the Society of Industrial and Organizational Psychology (SIOP, 2021a), which is Division 14 of the American Psychological Association (APA). In 6 of the last 7 years, one of SIOP's top 10 workplace trends has focused on employee well-being and wellness, including finding ways to enhance employee satisfaction and engagement (SIOP, 2021b). Furthermore, the topic was an important area of investigation within the field of positive psychology because it advanced knowledge of character strengths as a central positive psychology construct (Peterson & Seligman, 2004). Therefore, a research topic examining the impact of character strengths usage on desired work-related outcomes offered a timely contribution to SIOP's recent interest in employee well-being and positive psychology's growing body of knowledge related to the application of character strengths in the workplace.

Research Questions

The primary question for the research study was: Do character strengths interventions significantly impact levels of strengths use, job performance, and flourishing at work among full-time employees, ages 18-65? Thus, the following research questions were examined:

RQ1: Is there a statistically significant interaction effect between group and time for levels of strengths use, job performance, and flourishing at work among full-time employees, ages 18-65?

RQ2: Is there a statistically significant difference between time points for levels of strengths use, job performance, and flourishing at work among full-time employees, ages 18-65?

RQ3: Is there a statistically significant difference between groups for levels of strengths use, job performance, and flourishing at work among full-time employees, ages 18-65?

Definition of Terms

Three dependent variables were measured in this study: strengths use, job performance, and flourishing at work. Additionally, sample demographics were recorded. The strengths interventions used in the study were based on the VIA character strengths (Peterson & Seligman, 2004), which were central to the investigation. These terms are defined as follows.

Flourishing at Work. A multi-dimensional concept of employee well-being based on the PERMA (positive emotions, engagement, relationships, meaning, and accomplishments) theory of well-being (Seligman, 2011). Flourishing at work is the combination of the five PERMA pillars and is considered to be the state achieved when an individual experiences the benefits of each PERMA element in the workplace context.

Job Performance. An individual's in-role performance at work. Namely, the effective completion of expected tasks, duties, and responsibilities within an individual's job description (Williams & Anderson, 1991).

Sample Characteristics and Demographics. Inclusion criteria: (a) ages 18-65, (b) full-time employees, (c) high-speed Internet access, (d) U.S.-based participants on the Amazon Mechanical Turk (MTurk; Amazon Mechanical Turk, 2018) platform (referred to as MTurk

workers) who had completed at least 5,000 tasks on the platform and maintained a 95% task-completion approval rating. Demographic variables included (a) age, (b) gender, (c) occupation, and (d) state of residence.

Strengths Use. The psychological processes and behavioral capacities that facilitate optimal human functioning (Linley & Harrington, 2006; Peterson & Seligman, 2004).

VIA Character Strengths. The traits, qualities, and characteristics that are good and virtuous in humans (Peterson & Seligman, 2004).

Research Design

This section provides an overview of the methodology and research design. It explains how the experimental approach used for the intervention study aligned with the research topic and the positive psychology and I/O psychology disciplines.

Methodology and Research Design

The methodology used to answer the research question was quantitative, and the research design was longitudinal and experimental. The quantitative methodology was appropriate because variables were measured (Warner, 2013). An experimental approach was suitable because the research design required manipulation of two independent variables (i.e., time and the intervention groups), and there were several dependent variables (i.e., strengths use, job performance, flourishing at work). Additionally, the use of experimental research was consistent with the study's grounding disciplines. I/O psychology has primarily relied on quantitative methods (Austin et al., 2002), and when positive psychology was established, Seligman and Csikszentmihalyi (2000) emphasized conducting experimental and longitudinal studies. Thus, the experimental approach was aptly selected for the study.

Experimental Approach

An experimental research design is one in which three conditions are met. First, one or more independent variables are manipulated to examine the impact on one or more dependent variables. Second, there is at least one experimental group and one control group. Third, participants are randomly assigned to an experimental or control group. In the experimental group, the independent variables are manipulated, while in the control group, they are not (Kirk, 2009). The reason for meeting these conditions is to establish internal validity, which is the extent to which the results of a study may be used to identify cause-and-effect relationships (Warner, 2013). A study is considered to have high internal validity if a researcher can confidently conclude that manipulating the independent variable resulted in a change in the dependent variable (Cozby & Bates, 2018). Consequently, the experimental approach is often referred to as the "gold standard" research design because it is the methodology that offers the greatest internal validity (Sternberg, 2006). However, studies conducted with the rigorous requirements of an experimental design are not always comparable to a real-world situation, and therefore, often have reduced external validity (i.e., generalizability). Thus, the experimental methodological approach provides high internal validity, usually at the expense of reduced external validity (Cozby & Bates, 2018). Still, the experimental approach was appropriate for the dissertation topic because the study sought to identify a possible causal relationship between the strengths intervention and the outcome variables.

The study included three dependent variables: (a) strengths use, (b) job performance, and (c) flourishing at work. There were two independent variables: time and group. The independent variable of group had four levels: a placebo-control group and three different treatment groups. Participants were randomly assigned to the four groups for a 2-week intervention. Consequently,

this was a classic experimental research design because at least one independent variable was manipulated, participants were randomly assigned to groups, there was a control group, and the causal effect of the interventions was being investigated (Warner, 2013).

The independent variable of time had three levels as the dependent variables were measured across a period of 6 weeks. Participants (a) completed a pretest baseline questionnaire (Time 1), (b) were randomly assigned to the placebo-control group or one of three strengths intervention groups, and (c) completed two sets of posttest questionnaires: 2 weeks later, immediately after the intervention (Time 2); and 4 weeks after the first posttest questionnaire (Time 3). Therefore, this specific experimental study was a variation of the traditional "control-group, pretest-posttest" design (Leedy & Ormrod, 2019). In summary, an experimental study with a modified control-group, pretest-posttest design was deemed suitable for addressing the dissertation research topic. Table 1 provides a snapshot visual representation of the study design.

Table 1

The Study's Experimental and Longitudinal Research Design

Design	T1 (Pretest)	Intervention (2 weeks)	T2 (Posttest 1) (T1 + 2 Weeks)	T3 (Posttest 2) (T1 + 6 weeks)
Pretest-Posttest	O R	X_1	O	O
Randomized	O R	X_2	O	O
Experimental	O R	X_3	O	O
	O R	X_4	O	O

Note. O = observation; R = random allocation to groups; X_1 = placebo; $X_{2\text{-}4}$ = strengths interventions.

Assumptions and Limitations

This dissertation study was based on several assumptions—concepts and phenomena that were taken for granted and established at the outset. Additionally, although the study employed a rigorous experimental research design, it was not without limitations. This section addresses the various assumptions, limitations, and delimitations of the study.

Assumptions

Like all research, this study made various assumptions. These included theoretical, topic-specific, and general methodological assumptions. Each of these is addressed in this sub-section.

Theoretical Assumptions

The broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001) was used to guide the study. An assumption of this theory is personal agency—that individuals have the free will and ability to make decisions and determine one's course in life (Bandura, 2001). Indeed, agency is at the heart of positive psychology because the discipline is based on the fundamental belief that humans can choose to change. While biological and environmental conditions can constrain how much change is possible, there is still room for action. For example, Lyubomirsky, Sheldon, and Schkade (2005) suggested that genetics account for 50% of the variance for happiness (a key construct in positive psychology). Environmental factors account for 10%, leaving approximately 40% attributed to agentic behavior. Moreover, implicit in the broaden-and-build theory (Fredrickson, 1998, 2001) is the notion that individuals can choose and self-regulate their emotions (Tugade & Fredrickson, 2007) to achieve various life outcomes. In the context of the dissertation study, it was expected that voluntary participation in the intervention could affect change in individuals' strengths use, job performance, and

flourishing at work. Thus, the theoretical assumption of personal agency was central to the intervention study.

Topic-Specific Assumptions

The study accepted two foundational assumptions of character strengths. First, that character strengths are positive personal traits possessed by all individuals. Second, that character strengths are universal across countries, religions, and cultures (Peterson & Seligman, 2004). Certainly, some have questioned whether character strengths are ubiquitous (Kinghorn, 2017). However, other analyses have found significant convergence in character strengths identification across cultures (McGrath, 2015a, 2015b, 2016; Park et al., 2006), suggesting that they are indeed globally consistent. Therefore, in alignment with the positive psychology literature, the study assumed that all participants possessed and could identify with character strengths.

General Methodological Assumptions

The study used a quantitative approach, thereby adopting numerous general assumptions. The underlying philosophy of the study was positivism, which posits that scientific inquiry can only be performed on phenomena that can be seen or experienced (Hergenhahn & Henley, 2014). As such, the ontological assumption was that there is one reality that is stable, can be observed, and is measurable. The epistemological assumption was that knowledge can be garnered by measuring phenomena through scientific inquiry. The axiological assumption was that the researcher is objective and seeks to eliminate subjectivity or any source of bias. Thus, the methodological assumption was that quantitative methods of research are used in scientific inquiry (Goduka, 2012), and the logic assumption was deductive, because the study sought to confirm a stated hypothesis (Hall et al., 2013; Lynham, 2002). Moreover, there was an

assumption of causality because an experimental research design was used (Warner, 2013). A generalization assumption was only loosely adopted because the sample of MTurk (Amazon Mechanical Turk, 2018) workers could differ substantially from all U.S. employees, thereby limiting generalizability (Litman & Robinson, 2021). Thus, several assumptions were implied by the quantitative research design.

Other general assumptions were related to the participants and the study's execution. First, that all participants read and understood English at least at an eighth-grade level of education. Second, that participants responded to all of the questionnaires truthfully and faithfully participated in both weeks of their assigned intervention activity. Third, that all respondents were computer literate and had frequent Internet access to facilitate participation in the study. Finally, it was assumed that all participants followed the same protocol in responding to the questionnaires, and the use of random assignment eliminated any significant variance in participants across the intervention and placebo-control groups (Warner, 2013). Consequently, various general, philosophical, theoretical, and topic-specific assumptions were accepted in conducting the study.

Limitations

Two types of limitations were of note in the study. First, numerous research design limitations prevented the generalizability of findings and potentially reduced the effectiveness of the interventions tested. Second, some delimitations constrained the scope of the investigation. Each of these limitations is discussed in this sub-section.

Research Design Limitations

The research design resulted in several limitations. First, the use of MTurk (Amazon Mechanical Turk, 2018) workers as participants limited the generalizability of the study.

Although the investigation examined the impact of character strengths interventions among U.S.-based full-time employees, ages 18-65, recruitment of this population from MTurk meant that differences could exist between the study sample of U.S.-based full-time employees ages 18-65 and the population of all U.S.-based employees ages 18-65 (Litman & Robinson, 2021). Moreover, to help mitigate the expected 30%-80% attrition rate of the online study (Litman & Robinson, 2021; Mitchell et al., 2009), the sample was narrowed to only those MTurk workers who had completed at least 5,000 tasks and maintained a 95% task-completion approval rating. Thus, it was not possible to generalize the study results to all U.S.-based full-time workers, ages 18-65.

Second, the self-directed, online, and brief (just 2 weeks) intervention design could have limited its potential impact. Indeed, in-person interventions often have superior outcomes and less attrition than those that are self-administered (Sin & Lyubomirsky, 2009), and longer interventions tend to be more effective (Bolier et al., 2013). Additionally, although verification questions were included to confirm that participants watched, read, and understood the study intervention assignments, there was no way to know for sure that respondents engaged in the activities every day as instructed. Consequently, the intervention design might have contributed to efficacy and participation issues.

Finally, although the study was longitudinal, it only measured the dependent variables immediately following and 4 weeks after the intervention. Although these two posttest measures provided some indication of the intervention's effectiveness over time, further measures conducted over longer periods would have been more beneficial. For example, other intervention studies have measured the impact of using character strengths over 6 months (Seligman et al.,

2005) and 1 year (Duan et al., 2018). In summary, the research design had numerous limitations, all of which must be acknowledged in reporting the study results.

Delimitations

Similar to all studies, the research problem was narrowly defined, thereby limiting the scope of the investigation. The study addressed whether character strengths interventions effectively improved strengths use, job performance, and flourishing at work for full-time employees, ages 18-65. In particular, if focusing an intervention on the use of top strengths had more impact than focusing on the use of bottom strengths, or a combination of top and bottom strengths. Certainly, this problem facilitated the investigation of different types of strengths interventions on specific outcomes. However, the literature suggests that strengths interventions encouraging individuals to use other specific strengths, regardless of whether they are top or bottom strengths, are also a worthwhile investigation area (Niemiec, 2018; Ruch et al., 2020). Likewise, different outcome variables have been explored in strengths research that were not included in this study, such as OCB, job satisfaction (Lavy & Littman-Ovadia, 2017), and engagement (Littman-Ovadia et al., 2017). Consequently, the study was limited in scope to investigating the impact of interventions encouraging participants to use their top and bottom strengths and the dependent variables measured.

Organization of the Remainder of the Study

In summary, the dissertation topic was the impact of character strengths interventions on strengths use, job performance, and flourishing at work. The research problem was whether character strengths interventions are effective in improving strengths use, job performance, and flourishing at work for full-time employees, ages 18-65. Specifically, whether focusing an intervention on the use of top strengths has more impact than focusing on the use of bottom

strengths, or a combination of top and bottom strengths. Although several studies have examined character strengths in the workplace (e.g., Allan et al., 2019; Avey et al., 2012; Dubreuil et al., 2016; Harzer et al., 2017; Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010), only a few have examined the practical application of using or developing strengths at work (e.g., Dubreuil et al., 2016; Harzer & Ruch, 2016; Meyers & van Woerkom, 2017). Moreover, there has been little investigation into the benefits of using top versus bottom character strengths in the workplace. Consequently, this study sought to address this gap in the literature by conducting a longitudinal, experimental investigation, grounded by Fredrickson's (1998, 2001) broaden-and-build theory of positive emotions.

The remainder of the study offers more background and analysis on the topic before moving into the study methodology, results, and findings. In Chapter 2, an extensive review of the relevant literature that underpins the study is provided, including an in-depth discussion of the study's theoretical orientation and critique of previous research methods. In Chapter 3, the research questions, hypotheses, methodology, procedures, instruments, data collection and analysis, and ethical considerations are examined. Chapter 4 is the presentation of the statistical analyses and results. Finally, Chapter 5 is a discussion of the results and the inferred implications and recommendations.

CHAPTER 2. LITERATURE REVIEW

The study topic was the impact of character strengths interventions on strengths use, job performance, and flourishing at work. This chapter provides an extensive review of the relevant literature and theoretical framework that underpinned the study. The chapter starts by providing the full list of terms and sources used to search the literature. A discussion of the foundational theory used to guide the study and help predict outcomes follows. The literature review is also provided, along with a summary of pertinent findings. The literature review includes an overview of positive psychology, the movement towards strengths-based approaches, and an in-depth examination of character strengths, including their origin, purpose, and research to date. Research methods used in previous studies are critiqued, and a summation of the literary investigation rounds out the chapter.

Methods of Searching

A comprehensive method of searching pertinent terms was employed, including five databases and 30 different search terms. The databases used were PsychINFO, PsychARTICLES, Business Source Complete, Psychology Database, and Google Scholar. Within each database, the terms *character strengths* and *signature strengths* were searched independently and in combination with a range of relevant words and phrases: *work, employees, staff, workers, workplace, work performance, job performance, employee performance, flourishing, strengths use, productivity, efficiency, performance, organization(s), employee well-being/wellbeing,* and *employee wellness*. Terms related to strengths, weaknesses, and interventions were also searched: *strengths balance at work, strength(s) deficit, strength(s) deficit at work, strengths use and deficit and work, strengths and weaknesses at work, signature strengths versus lower strengths, character strengths interventions, character strengths*

interventions at work, character strengths interventions in the workplace, strengths interventions in the workplace, strengths and deficits interventions, strengths and deficits interventions in the workplace.

Additionally, the VIA Institute on Character (2021c) website was consulted. This website is the digital home for information about character strengths, and it provides a publicly accessible repository of character strengths research studies (VIA Institute on Character, 2021b), several of which were relevant to the dissertation topic.

Theoretical Orientation for the Study

The theoretical orientation for the study was the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001). The theory is well-established in the field of positive psychology (Lyubomirsky, King, & Diener, 2005; Lyubomirsky & Layous, 2013; Mongrain & Anselmo-Matthews, 2012; Seligman, 2011). Additionally, it has been applied in organizational contexts (Cameron, 2012; Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017; Meyers & van Woerkom, 2017; van Woerkom & Meyers, 2015). The theory posits that unlike negative emotions, which are linked to physical-action tendencies, positive emotions are associated with cognitive or "thought-action" tendencies (Fredrickson, 1998). There are three main tenets to the broaden-and-build theory.

First, the theory posits that in contrast to negative emotions, which narrow and limit individuals' thought-action responses, positive emotions broaden them by expanding individuals' attention, cognition, and social cognition (Conway et al., 2013; Fredrickson, 2004). For instance, the research suggests that positive emotions generate greater executive attention and emotional processing (Rowe et al., 2007; Wadlinger & Isaacowitz, 2006), more flexible thinking, better problem solving, creativity (Ashby et al., 1999; Isen et al., 1987), and a greater connection

between oneself and others (Johnson & Fredrickson, 2005; Waugh & Fredrickson, 2006). Thus, positive emotions broaden individuals' thought-action tendencies.

The second tenet of the broaden-and-build theory (Fredrickson, 1998, 2001) is that as frequent positive emotions are experienced over time, they build psychological, physical, and social resources. For instance, there is evidence that frequent positive emotions induced over 7 weeks were associated with increased self-acceptance, physical health, competence, purpose, and better relationships (Fredrickson et al., 2008). Similarly, positive emotions have been connected with enhanced physical and psychological resilience (Tugade & Fredrickson, 2004; Tugade et al., 2004). Thus, the effects of positive emotions build or accrue over time, producing greater well-being and personal resources (Fredrickson & Joiner, 2018).

Finally, the third tenet of the theory is that positive emotions have an undoing effect on negative emotions. For example, an experimental study showed that after negative emotional arousal, participants who experienced positive emotions demonstrated faster cardiovascular recovery than those who subsequently experienced sadness or neutral emotions (Fredrickson & Levenson, 1998). Similar results have been replicated in more recent studies, and other undoing evidence points to positive emotions counteracting stress and depressive symptoms (Fredrickson, 2013). Thus, the broaden-and-build theory (Fredrickson, 1998, 2001) states that positive emotions broaden thought-action tendencies, undo the effects of negative emotions, and over time, build personal resources.

Relevance of the Broaden-and-Build Theory

Fredrickson's (1998, 2001) broaden-and-build theory of positive emotions was pertinent to the dissertation topic. It provided a positive psychology theoretical framework to guide predictions for the impact of character strengths interventions on strengths use, job performance,

and flourishing at work. For example, character strengths are considered a pathway to well-being and flourishing (Seligman, 2011) and have been linked with positive employee attitudes toward organizational change (Vacharkulksemsuk & Fredrickson, 2013). Additionally, performance may be related to character strengths per the happy/productive worker concept (Lyubomirsky, King & Diener, 2005; Staw, 1986). Furthermore, consistent with the broaden-and-build theory, character strengths have been positively correlated with dispositional positive emotions (i.e., joy, contentment, pride, love, compassion, amusement, and awe) (Güsewell & Ruch, 2012). Moreover, positive affect has been identified as a mediator between strengths use and favorable work-related outcomes, such as enhanced productivity, OCB, job satisfaction (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017), work meaningfulness, engagement (Littman-Ovadia et al., 2017), reduced burnout (Meyers & van Woerkom, 2017), and increased performance (van Woerkom & Meyers, 2015). For these reasons, the broaden-and-build theory was a relevant framework for predicting and potentially explaining the outcome of character strengths interventions in the workplace.

Review of the Literature

Broadly, the dissertation topic examined the application of positive psychology in the workplace. More specifically, the topic was the impact of character strengths interventions on strengths use, job performance, and flourishing at work, and if there were different outcomes when employees were encouraged to use top strengths versus bottom strengths or a combination of both. Character strengths are a core construct in positive psychology (Peterson & Seligman, 2004). Interventions typically involve individuals taking the VIA character strengths assessment (VIA Institute on Character, 2021a) to identify their strengths and engaging in daily activities to use and develop their strengths (Biswas-Diener et al., 2017; Seligman et al., 2005). The primary

research question was, do character strengths interventions significantly impact levels of strengths use, job performance, and flourishing at work among full-time employees, ages 18-65? Thus, the topic and research question indicated two independent variables (i.e., time and intervention groups), and three dependent variables (i.e., strengths use, job performance, and flourishing at work) were measured. Therefore, a quantitative method was needed to address the dissertation topic (Warner, 2013). Additionally, because the topic implied manipulation of independent variables, an experimental or quasi-experimental research design was required (Leedy & Ormrod, 2019), which was consistent with the positive psychology discipline (Seligman & Csikszentmihalyi, 2000; Seligman, 2011). This literature review addresses the topic's grounding in positive psychology and various aspects of the study design.

The review is divided into several sub-sections that examine the foundational literature that informed the study. The review begins with an overview of positive psychology, including its establishment as a discipline with specific guiding principles. The next section addresses a particular aspect of positive psychology: personal strengths. It is followed by a discussion of developing strengths versus addressing deficits and the need for more investigation in this area. Subsequently, the review narrows to focus on character strengths, examining their origin, classification, universality, general research findings, and work-related research. Following is an examination of character strengths interventions in the workplace, the basis for investigating the impact of interventions focused on top versus bottom strengths, the study's research design, and various work-related variables measured. Finally, the methodological approach is assessed through the lens of positive psychology and I/O psychology.

Overview of Positive Psychology

Positive psychology is a relatively young field of research. It is generally recognized as established in 1998 when Dr. Martin Seligman, then APA president, appealed for more emphasis to be placed on "understanding and building the most positive qualities of an individual…to make the lives of all people more fulfilling and productive" (Seligman, 1999, p. 559). Since its inception, scoping literature reviews suggested that positive psychology experienced massive growth and has been well-established as its own area of scientific study (Donaldson et al., 2015; Rusk & Waters, 2013). Despite this recent growth, it has always been recognized that positive psychology was not a new concept (Seligman & Csikszentmihalyi, 2000, p. 13). The roots of positive psychology can be found in several philosophical traditions (Lambert et al., 2015) and multiple psychological disciplines, including evolutionary, cultural, personality, and social psychology (Ng, 2016). Moreover, its principles, values, and subject matter can all be traced back to the humanistic school of thought (Hergenhahn & Henley, 2014). Thus, positive psychology is a relatively nascent movement devoted to the study of what constitutes a fulfilling life and derivative of other psychology disciplines.

When Seligman founded positive psychology, he did so by establishing three foundational principles to guide the field. First, instead of focusing on human deficits and what was wrong with people as psychology had done for decades, positive psychology would focus on what was right with people and how they could flourish in everyday life (Seligman, 1999). Indeed, he made the point that reducing psychological ails such as stress, anxiety, and depression did not lead to happiness. It simply moved individuals to a neutral state where they no longer suffered as much but were far from thriving. Accordingly, positive psychology adopted the mantle of seeking to understand what could make people happy and increase their well-being

(Seligman & Csikszentmihalyi, 2000). Although positive psychology has been criticized for focusing too much on the positive aspects of life and ignoring the negative (Grant & Schwartz, 2011), as the field has matured it has recognized the value of both (Wong, 2011). Consequently, positive psychology is still guided by the foundational principle of studying how to achieve human flourishing, but this now also includes research and acknowledgment of the shadow side of life.

The second foundational principle of positive psychology was that it would be an applied social science. This objective would be accomplished by developing and testing interventions that would have practical application for individuals, organizations, and communities. Such interventions are considered the ultimate goal of positive psychology (Seligman et al., 2005). These positive psychology interventions are defined as activities that focus on positive issues, function by a positive process, or target a positive result, and are intended to enhance wellness rather than reduce deficits (Parks & Biswas-Diener, 2013). Two meta-analyses demonstrated that these interventions could be effective in increasing well-being and reducing depressive symptoms (Bolier et al., 2013; Sin & Lyubomirsky, 2009). Examples of positive psychology interventions include identifying and using character strengths (Seligman et al., 2005), practicing savoring, gratitude, kindness (Schueller & Parks, 2014), and mindfulness (Ivtzan et al., 2016). Thus, as Seligman (1999) envisioned, positive psychology has always sought to apply its findings and benefit people beyond the world of academia.

The third foundational principle was related to how the research would be conducted in positive psychology. Seligman and Csikszentmihalyi (2000) acknowledged that humanistic psychology had studied similar topic areas and that positive psychology was not a novel invention. Indeed, Abraham Maslow, largely considered the father of the humanistic movement,

steered psychologists to explore how healthy individuals could develop and realize their full potential (Maslow, 1943). However, Seligman and Csikszentmihalyi (2000) criticized the humanistic movement for its lack of empirical research and declared that positive psychology would adhere to more stringent scholarly standards. They inferred that positive psychology would engage primarily in quantitative research methods rather than qualitative research methods, such as are often employed by the humanistic field. This methodological divergence caused much animosity between the two fields. Although more recently, there have been efforts to bridge this gap by acknowledging that each discipline can and does use both quantitative and qualitative methods (Robbins & Friedman, 2008). Moreover, there have been calls for more qualitative research methods in positive psychology (Hefferon et al., 2017) and an increase in methodological pluralism in both humanistic and positive psychology (Davis, 2009). Consequently, positive psychology has a long-standing preference for quantitative methods, though qualitative studies have become more acceptable in recent years.

In summary, positive psychology was established as an antidote to the traditional psychology focus of addressing what is wrong with people. Instead, this new field sought to examine the good in people and how they could lead happy and fulfilling lives by developing rigorously tested interventions. Implicit in Seligman's (1999) vision was a focus on personal strengths rather than weaknesses. As such, one of the earliest calls in positive psychology was for "massive research on human strengths and virtues" and that "psychologists working with families, schools, religious communities, and corporations, need to develop climates that foster these strengths" (Seligman & Csikszentmihalyi, 2000, p. 8). Therefore, as positive psychology was born, so too was a special focus on identifying and nurturing strengths.

Personal Strengths

Personal strengths are defined as individual qualities, traits, and abilities that are energizing to use and facilitate optimal functioning (Linley & Harrington, 2006; Peterson & Seligman, 2004; Wood et al., 2011). Working with human strengths is an essential concept in positive psychology because it focuses on what allows people to flourish (Seligman & Csikszentmihalyi, 2000). Still, the study of strengths predates the emergence of positive psychology (Hodges & Asplund, 2010), and there are several classifications of personal strengths, each with its own specific purpose. For example, the CliftonStrengths (Gallup Strengths Center, 2021) are specifically focused on work-related strengths, while the VIA classification of character strengths (Peterson & Seligman, 2004) inventories different strengths that can be called on and used in any facet of life (Niemiec, 2018). Additionally, Realise2 (now StrengthsProfile), developed by Linley and colleagues (2010), is a classification of 60 strengths that not only informs but indicates the relative contribution of the strengths to optimal human functioning. Thus, personal strengths can be identified and measured using various different instruments.

A range of literature demonstrates that becoming aware of and using strengths often leads to positive outcomes. In a general population study, people who become aware of their top strengths were nine times more likely to flourish than those who were unaware, and those who used their top strengths were 18 times more likely to flourish than those who did not (Hone et al., 2015). Moreover, using strengths in new ways has demonstrated lower levels of depressive symptoms and an increase in happiness over 6 months (Gander et al., 2013; Seligman et al., 2005). In the field of psychotherapy, focusing on strengths has yielded a greater positive impact on clients than traditional treatment methods (Seligman et al., 2006). In education, a strengths-

based approach has been associated with increased engagement and accomplishment (Linkins et al., 2015). Finally, in the workplace, strengths use has been correlated with multiple favorable outcomes (e.g., Harzer & Ruch, 2012, 2013, 2014, 2015). Thus, there is evidence that a strengths-based approach can have multiple benefits across various settings and environments.

However, knowing and using one's strengths does not always result in positive outcomes. Indeed, Biswas-Diener and colleagues (2011) recommended moving beyond simply identifying and using strengths to developing strengths for optimal value so that individuals know when and how to use specific strengths in context. Additionally, Niemiec (2019) noted that the downside of strengths use can occur when personal strengths are either overused, underused, or misused. Thus, for optimal benefit, the right strengths should be applied in just the right amount at the right time. Consequently, strengths are contextual and require mindful application for maximum benefit. Moreover, some scholars (e.g., Mahomed & Rothman, 2019; Meyers et al., 2015; Mphahlele et al., 2018) have suggested that a more balanced approach to developing strengths and addressing deficits could be valuable.

Strengths Versus Deficits

The question of whether to prioritize deficit reduction or strength development has long been discussed (Hodges & Asplund, 2010; Biswas-Diener et al., 2017; van Woerkom et al., 2016). Prior to the positive psychology movement, psychology emphasized diagnosing and addressing human deficits rather than strengths (Seligman, 1999). In the years since the movement emerged, a range of evidence suggested that focusing on strengths produces better results than focusing on deficits. For example, a strengths-based cognitive-behavioral treatment program yielded better outcomes for individuals diagnosed with major depressive disorder than a deficit-focused program (Cheavens et al., 2012). Similarly, a strengths-based psychotherapy

program relieved depressive symptoms among severely depressed individuals better than typical psychotherapy treatment or medication (Seligman, 2011). However, some scholars have questioned the wisdom of over-emphasizing strengths (Grant & Schwartz, 2011; Kaiser & Overfield, 2011; Niemiec, 2018), and recent research suggests that individuals can benefit from both a strengths-based and deficit-based approach (Mahomed & Rothman, 2019; Meyers et al., 2015; Mphahlele et al., 2018).

Strengths are human characteristics and abilities that are enjoyable to use and allow individuals to function at their best (Linley & Harrington, 2006; Peterson & Seligman, 2004; Wood et al., 2011). By contrast, deficits are defined as characteristics, behaviors, or ways of thinking that do not come naturally and might not be enjoyable (Meyers et al., 2015). Particularly in the workplace context, most organizations have long-emphasized the need to correct deficits rather than develop strengths (Buckingham & Clifton, 2001; Rath & Conchie, 2009). Strengths proponents argue that a deficit-based approach has limited benefit because it is more challenging and somewhat deflating for individuals to spend time working on what they are not good at (Buckingham & Clifton, 2001; Peterson & Seligman, 2004; Rath & Conchie, 2009; Seligman, 1999). Still, there is evidence that deficit improvement yields valuable results. Some studies found that a deficit-based approach was associated with increased work performance (Abdullah et al., 2009; Anguinis & Kraiger, 2009), more job satisfaction (Lee & Bruvold, 2003), and improved work engagement (Salas et al., 2012). At the same time, strengths-based approaches have also been linked with greater productivity, job satisfaction (Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010), and performance (Bakker & van Woerkom, 2018). Therefore, it seems possible that individuals and organizations could benefit from both strengths development and deficit correction.

Some recent studies conducted in South Africa indicated that a combined approach of working with strengths and weaknesses could be beneficial. Mphahlele and colleagues (2018) found that perceived organizational support (POS) for strengths use and POS for deficit correction were both positively correlated with work engagement, but only POS for deficit correction significantly predicted work engagement over the long-term. Similarly, Mahomed and Rothman (2019) observed that both POS for strengths use and deficit correction predicted thriving at work. Additionally, another study identified that employees who perceived organizational support for both strengths use and deficit improvement had more job satisfaction than those who only reported POS for strengths use. However, these studies were cross-sectional, thereby limiting their generalizability. Still, a quasi-experimental study comparing the impact of a strengths-based intervention versus a deficit-based intervention among college students found that both produced increases in personal growth initiative over 3 months, though the increases were larger for the strengths group (Meyers et al., 2015). Consequently, there is some evidence that both strengths-based and deficit-based approaches can offer desirable outcomes. Still, more research is needed to understand the impact of focusing on strengths versus deficits. The current study attempted to address this identified need with a special focus on the use of character strengths in the workplace.

Positive Psychology and Character Strengths

As the positive psychology movement emerged at the turn of the 21st century, Seligman and Csikszentmihalyi (2000) emphasized the need to focus on human strengths rather than weaknesses when "working with families, schools, religious communities, and corporations" (p. 8). However, in its naissance, positive psychology lacked a common structure for researchers to work with this new approach (Samuels & Hoxsey, 2010). Consequently, in consultation with Dr.

Neal Mayerson, Seligman proposed a central framework for understanding the human characteristics that facilitate positive emotions and actions that can be nurtured to benefit individuals, organizations, and society (Mayerson, 2020). Thus, a 3-year investigation was born. Led by the late Dr. Christopher Peterson, over 50 psychology scholars set out to review and categorize what is good and virtuous about people across nations, religions, and cultures (Samuels & Hoxsey, 2010). The result was the Values in Action (VIA) classification of character strengths.

The VIA Classification of Character Strengths

The VIA classification of character strengths encompassed a review of philosophies, religions, and cultures worldwide. These included Confucianism and Taoism from China, Buddhism and Hinduism from South Asia, ancient Greek and Judeo-Christian values and beliefs from the West, and Islamic virtues from the Middle East (Samuels & Hoxsey, 2010). Additionally, contemporary sources of virtues were consulted, such as those of Charlemagne, Benjamin Franklin, the Boy Scouts of America, Girl Guides of Canada, and modern greeting cards (Peterson & Seligman, 2004). This extensive search yielded six comprehensive categories, now known as the VIA virtues: wisdom, courage, humanity, justice, temperance, and transcendence (Mayerson, 2020). From these broad groupings, the component elements considered the "the psychological ingredients—processes or mechanisms—that define the virtues" (Peterson & Seligman, 2004, p. 13) were identified and became known as the 24 VIA character strengths.

As classified within the six virtues, the 24 character strengths were identified by Peterson and Seligman (2004). Included in the virtue of *wisdom and knowledge* were the character strengths of *creativity*, *curiosity*, *judgment* (i.e., open-mindedness, critical thinking), *love of*

learning, and *perspective*. Within the virtue of *courage* were the strengths of *bravery*, *persistence*, *honesty*, and *zest*. The virtue of *humanity* was defined by the strengths of *love*, *kindness*, and *social intelligence*. Encompassed within the virtue of *justice* were the strengths of *citizenship*, *fairness*, and *leadership*. The virtue of temperance included the strengths of *forgiveness*, *humility*, *prudence*, and *self-regulation*. Finally, the virtue of *transcendence* consisted of the strengths of *appreciation of beauty and excellence*, *gratitude*, *hope*, *humor*, and *spirituality*. Table 2 provides the full classification of VIA virtues and character strengths as detailed in Peterson and Seligman (2004).

Table 2

The VIA Classification of 24 Character Strengths, Grouped by Virtue

Virtue/Strength	Definition
Wisdom and knowledge	Cognitive strengths that entail the acquisition and use of knowledge
Creativity [originality, ingenuity]	Thinking of novel and productive ways to do things: includes artistic achievement but is not limited to it
Curiosity [interest novelty-seeking, openness to experience]	Taking an interest in ongoing experience for its own sake; finding subjects and topics fascinating; exploring and discovering
Open-mindedness [judgment, critical thinking]	Thinking things through and examining them from all sides; *not* jumping to conclusions; being able to change one's mind in light of evidence; weighing all evidence fairly
Love of learning	Mastering new skills, topics, and bodies of knowledge, whether on one's own or formally; obviously related to the strength of curiosity but goes beyond it to describe a tendency to add *systematically* to what one knows
Perspective [wisdom]	Being able to provide wise counsel to others; having ways of looking at the world that make sense to oneself and to other people
Courage	Emotional strengths that involve the exercise of will to accomplish goals in the face of opposition, external or internal
Bravery [valor]	*Not* shrinking from threat, challenge, difficulty, or pain; speaking up for what is right even if there is opposition; acting on convictions even if unpopular; includes physical bravery but is not limited to it
Persistence [perseverance, industriousness]	Finishing what one starts; persisting in a course of action despite obstacles; "getting it out the door"; taking pleasure in completing tasks

Virtue/Strength	Definition
Integrity [authenticity, honesty]	Speaking the truth but more broadly presenting oneself in a genuine way and acting in a sincere way; being without pretense; taking responsibility for one's feelings and actions
Vitality [zest, enthusiasm, vigor, energy]	Approaching life with excitement and energy, *not* doing things halfway or halfheartedly; living life as an adventure; feeling alive and activated
Humanity	Interpersonal strengths that involve tending and befriending others
Love	Valuing close relationships with others, in particular those in which sharing and caring are reciprocated; being close to people
Kindness [generosity, nurturance, care, compassion, altruistic love, "niceness"]	Doing favors and good deeds for others; helping them; taking care of them
Social intelligence [emotional intelligence, personal intelligence]	Being aware of the motives and feelings of other people and oneself; knowing what to do to fit into different social situations; knowing what makes other people tick
Justice	Civic strengths that underlie healthy community life
Citizenship [social responsibility, loyalty, teamwork]	Working well as a member of a group or team; being loyal to the group; doing one's share
Fairness	Treating all people the same according to notions of fairness and justice; *not* letting personal feelings bias decisions about others; giving everyone a fair chance
Leadership	Encouraging a group of which one is a member to get things done and at the same time maintain good relations within the group; organizing group activities and seeing that they happen
Temperance	Strengths that protect against excess
Forgiveness [mercy]	Forgiving those who have done wrong; accepting the shortcomings of others; giving people a second chance; *not* being vengeful
Humility [modesty]	Letting one's accomplishment speak for themselves; *not* seeking the spotlight; *not* regarding oneself as more special than one is
Prudence	Being careful about one's choices; not taking undue risks; not saying or doing things that might be later regretted
Self-regulation [self-control]	Regulating what one feels and does; being disciplined; controlling one's appetites and emotions
Transcendence	Strengths that forge connections to the larger universe and provide meaning
Appreciation of beauty and excellence [awe, wonder, elevation]	Noticing and appreciating beauty, excellence, and/or skilled performance in various domains of life, from nature to mathematics to science to everyday experience

Virtue/Strength	Definition
Gratitude	Being aware of and thankful for the good things that happen; taking time to express thanks
Hope [optimism, future-mindedness, future orientation]	Expecting the best in the future and working to achieve it; believing that a good future is something that can be brought about
Humor [playfulness]	Liking to laugh and tease; bringing smiles to other people; seeing the light side; making (not necessarily telling) jokes
Spirituality [religiousness, faith, purpose]	Having coherent beliefs about the higher purpose and meaning of the universe; knowing where one fits within the larger scheme; having beliefs about the meaning of life that shape one's conduct and provide comfort

Note. Character strengths are grouped by virtues. The labels in brackets represent synonyms or related concepts for each identified strength. Adapted from *Character Strengths and Virtues: A Handbook and Classification* (pp. 29-30), by C. Peterson and M. E. P. Seligman, 2004, Oxford University Press. Copyright 2004 by Values in Action Institute. Reproduced with permission of Oxford Publishing Limited through PLSclear.

Ten criteria were used to determine the inclusion of a character strength in the inventory, in addition to the requirement that each strength was ubiquitous. Specifically, as noted by Peterson and Seligman (2004), each strength had to qualify as (a) fulfilling for oneself and others, (b) morally valued, (c) not diminishing others, (d) having obvious negative antonyms, (e) trait-like (i.e., can be generalized across situations and stable over time), (f) distinct from other character strengths, (g) embodied in certain individuals (i.e., paragons), (h) exceptionally demonstrated in some children (i.e., prodigies), (i) absent in some individuals, and (j) actively cultivated by institutions and societies.

The culmination of this extensive research project identifying the VIA virtues and character strengths was summarized in a seminal publication, *Character Strengths and Virtues: A Handbook and Classification* by Drs. Peterson and Seligman (2004), which is largely considered the positive counterpart to psychology's *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013). Indeed, Peterson and Seligman (2004) described their handbook as a "manual of the sanities" (p. 3). After the handbook

publication, psychometric instruments were developed to measure character strengths, referred to as the VIA Inventory of Strengths (VIA-IS) or VIA survey. To date, the VIA-IS has been translated into more than 40 languages, over 700 research articles related to character strengths have been published and, on average, an individual completes the VIA-IS every 10 seconds (Mayerson, 2020). Consequently, although a relatively new area of psychological study, since identifying and articulating the 24 VIA character strengths, a substantial amount of research has been conducted.

Universality of Character Strengths

In their publication of the 24 VIA character strengths, Peterson and Seligman (2004) posited that the strengths were "ubiquitously recognized and valued" (p. 13). Certainly, the process to identify the strengths examined an extensive range of cultures, philosophies, and literature around the world from ancient history to present-day (Mayerson, 2020). Still, some have questioned the universality of character strengths. For example, Kinghorn (2017) argued that the cross-cultural claim of character strengths lacked methodological and philosophical grounding and is instead a reflection of the values and beliefs of the scholars who developed them. Similarly, Snow (2019) contended that the VIA classification of strengths was influenced by Western culture, and errors may have been made in judging the similarity of virtues and strengths across cultures. For example, the character strength of integrity could be interpreted in individualistic cultures as representing oneself authentically. However, in collectivist cultures, it is more likely associated with the notion of maintaining social harmony (Lopez et al., 2015). Similarly, the virtue of wisdom could be perceived differently across cultures, and there are multiple ways to operationally define and measure wisdom (Glück et al., 2013). Thus, despite

efforts to identify universal strengths and virtues in the VIA classification (Peterson & Seligman, 2004), some have challenged the ubiquitous nature and construct of character strengths.

Several studies have been conducted to examine the structure and cross-cultural value of the VIA virtues and character strengths. A consistent finding is that the original six-virtue structure proposed by Peterson and Seligman (2004) has not been confirmed. On the contrary, most studies have yielded structures with 3-5 factors (e.g., McGrath, 2014, 2015b). Additionally, Ruch and Proyer (2015) found that some of the 24 character strengths could be aligned with more than one virtue category. Still, these findings are unsurprising in the sense that the six original virtues and the character strengths that comprise them were developed theoretically rather than empirically. Indeed, Peterson and Seligman (2004) acknowledged that their classification was not perfect and called on future research to test and refine their work. Moreover, there is evidence that suggested the strengths are cross-culturally valid even if the six-virtue structure has not held up over time.

The empirical data suggest that the 24 VIA character strengths are at least somewhat universal. A study of 54 nations and all 50 U.S. states, with a sample of N = 117,676 adults, indicated that the character strengths' profiles of U.S. respondents converged with the profiles of 53 other nations (Park et al., 2006). That early investigation was followed by a more comprehensive examination of character strengths across 75 nations and a sample of N = 1,063,921 adults, which confirmed substantial cross-cultural convergence (McGrath, 2015a). Further, with a sample of N = 15,540 adults across 16 nations, McGrath (2016) found configural and metric invariance for translations of the VIA survey, implying that the VIA classification and the instrument used to measure strengths has cross-cultural relevance. Thus, there is reason to consider the character strengths as relatively ubiquitous, notwithstanding claims otherwise.

General Research on Character Strengths

When the 24 VIA character strengths were first articulated, Peterson and Seligman (2004) posited that the strengths contribute to well-being and fulfillment. Ten to 15 years of research on character strengths has yielded hundreds of academic publications (Mayerson, 2020), many of which have confirmed this hypothesis. Indeed, character strengths have been associated with increased well-being (Harzer, 2016; Kaufman et al., 2015; Wagner, Gander, et al., 2020), happiness, meaning in life (Karris Bachik et al., 2020; Smith et al., 2020), physical health (Graziosi et al., 2020; Proyer, Gander, et al., 2013; Umucu et al., 2020), and achievement (Wagner, Holenstein, et al., 2020; Wagner & Ruch, 2015). Additionally, character strengths have been linked with resiliency (Demirci et al., 2019; Karris Bachik et al., 2020), overcoming adversity (Casali et al., 2020; Martinez-Marti et al., 2020), and dealing with disability (Smedena, 2020). Moreover, specific character strengths have been identified as the main contributors to a happy and fulfilled life. These include the strengths of love, hope, curiosity, and zest, which were most strongly linked with life satisfaction (Peterson et al., 2007). Indeed, those strengths, along with gratitude, are commonly referred to as the "happiness strengths" (Buschor et al., 2013; Niemiec, 2018). Thus, there is ample evidence that character strengths provide numerous well-being benefits.

Although character strengths are often likened to personality traits in their stability, Peterson and Seligman (2004) also hypothesized that the strengths were malleable and could be cultivated. Indeed, longitudinal research has provided evidence of both stability and change in character strengths (Gander et al., 2020), and field research has indicated that intentional use or development of strengths leads to positive outcomes. For instance, some studies found that when individuals used their top or signature strengths differently it increased happiness and decreased

depressive symptoms for up to 6 months (Gander et al., 2013; Seligman et al., 2005). Another study observed an increase in life satisfaction after participating in an intervention targeting the character strengths of curiosity, gratitude, humor, hope, and zest (Proyer et al., 2013). More recently, Chérif et al. (2020) tested an intervention that cultivated all 24 character strengths and found that it significantly increased happiness scores that were sustained 1 month later. Additionally, meta-analyses of character strengths interventions have consistently found that encouraging individuals to identify and use their strengths results in significant increases in well-being (Quinlan et al., 2012), happiness and life satisfaction, and decreases in depressive symptoms (Schutte & Malouff, 2019). Consequently, the research indicates that actively fostering and developing character strengths produces favorable outcomes.

Work-Related Research on Character Strengths

Several studies have examined connections between specific character strengths and work-related outcomes. For instance, the strengths of gratitude, hope, zest, curiosity, and spirituality were positively associated with work satisfaction for a range of occupations, including laborers and professionals (Peterson et al., 2010). In another study, Gander and colleagues (2012) found that strengths of zest, persistence, hope, and curiosity contributed to healthy and ambitious work behavior among working women. Furthermore, Allan et al. (2019) found that among counselors, the strengths of love, perspective, and zest predicted meaningful work, while forgiveness, honesty, and self-regulation predicted burnout, and the strengths of prudence and hope predicted both outcomes. Additionally, strengths of judgment (i.e., critical thinking), love of learning, curiosity, originality, and perspective were positively correlated with employees' creative work performance (Kayler & Kaylar, 2018). Similarly, Sosik et al. (2012) identified a positive relationship between the character strengths of bravery, integrity,

perspective, and social intelligence and executive leadership performance in organizations. Thus, a good deal is known about the connection between specific character strengths and work-related outcomes.

In addition, numerous studies have examined the impact of applying and using character strengths in the workplace. For example, using character strengths at work was associated with well-being and more meaning (Littman-Ovadia & Steger, 2010). When four to seven top strengths were used at work, employees had more positive work experiences and were more likely to see purpose in their work (Harzer & Ruch, 2012). Moreover, use of character strengths has been described as a "driver" of employee engagement (Crabb, 2011) and linked with greater productivity, OCB, job satisfaction (Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010), creativity (Avey et al., 2012), and performance (Littman-Ovadia et al., 2017). Also, character strengths were correlated to coping at work and served as protective factors against work-related stress on job satisfaction (Harzer & Ruch, 2015). Conversely, a lack of opportunities to use character strengths each day was associated with employees feeling strain at work (Merritt et al., 2018). Consequently, the research suggests that the use of character strengths at work contributes to various desirable outcomes. While this evidence has contributed to academic knowledge of character strengths, only a few studies have investigated the practical application of character strengths interventions in the workplace.

Character Strengths Work Interventions

There is a dearth of knowledge concerning the impact of character strengths interventions in the workplace. Indeed, most character strengths intervention studies have focused on the general population or student audiences and have measured the impact of the intervention on constructs such as life satisfaction, happiness, positive affect, and depression (Ghielen et al.,

2018; Quinlan et al., 2012; Schutte & Malouff, 2019). The relatively few character strengths workplace intervention studies point to potential benefits for employers and employees, yet more knowledge is needed for optimal deployment. Peláez and colleagues (2020) found that a 5-week strengths-based intervention enhanced employee work engagement and job performance. Additionally, Forest et al. (2012) demonstrated that a character strengths intervention significantly increased harmonious passion, well-being, and participants' use of their top strengths among working students.

Other studies indicated that participation in character strengths interventions led to increases in employee positive affect, psychological capital (Meyers & van Woerkom, 2017), life satisfaction, and perceiving work as a calling (Harzer & Ruch, 2016). Still, another study by Dubreuil et al. (2016) identified that employees reported greater strengths use and well-being following a character strengths intervention, though no significant difference was found for work performance, harmonious passion, vitality, and concentration. Further investigation indicated that employees who reported the greatest increase in using strengths did, in fact, demonstrate significant increases in work performance and harmonious passion. These findings suggested that employees' level of strengths use might play a role in achieving favorable outcomes, though more investigation would be needed to substantiate this speculation.

Additionally, there is a lack of knowledge regarding the effectiveness of using top versus bottom character strengths or a combination of both. Top and bottom strengths are identified when an individual takes the VIA assessment (VIA Institute on Character, 2021a) and receives a personalized report ranking all 24 character strengths. In one study, participants reported higher levels of global life satisfaction and perceiving work as a calling after an intervention to increase the use of their top four character strengths in the workplace (Harzer & Ruch, 2016). These

results suggested that an intervention intended to increase top strengths use could support favorable work-related outcomes. However, an unpublished employee intervention study—cited only due to the scarcity of peer-reviewed research in this area—revealed little difference in results between groups assigned to focus on top strengths versus bottom strengths (Walker, 2013). Thus, more investigation was needed in this area.

Two other studies that examined the use of top and bottom character strengths also found little difference in outcomes. Rust et al. (2009) found no significant difference in life satisfaction among students who focused on using top strengths than those who used both top and bottom strengths. Similarly, in a general population study, Proyer et al. (2015) showed significant increases in happiness and decreases in depressive symptoms for up to 3 months in a group assigned to use top strengths and another group assigned to use bottom strengths. Thus, character strengths workplace intervention studies have provided some guidance on the impact of strengths use. However, the studies by Rust and colleagues and Proyer and team were not conducted in an organizational context. Therefore, not much intervention research exists regarding the use of top versus bottom character strengths in the workplace. Consequently, further investigation was needed to determine whether interventions should focus on employees developing their top strengths, bottom strengths, or both.

Character Strengths Versus Deficits

The present study sought to examine the impact of different character strengths interventions targeting top strengths, bottom strengths, or a combination of both—what might be considered a strengths-versus-deficits design. Still, it is important to acknowledge that all 24 character strengths are considered strengths, regardless of their ranking in a person's profile (Niemiec & McGrath, 2019). Therefore, even lesser or bottom-ranking strengths are thought of

as strengths rather than weaknesses or deficits. They are simply strengths that are "undeveloped, unrealized, not as valued as the other strengths, or…less used compared to other strengths" (Niemiec, 2018, p. 18). By contrast, a person's signature or top-ranking strengths are "most central to who the person is and…more energizing to use and more natural to express than the other strengths" (Niemiec, 2018, p. 18). Thus, strictly speaking, the study's interventions all targeted strengths rather than strengths versus deficits. However, per Meyers et al. (2015), deficits are "ways of behaving, thinking, or feeling that do not come natural to an individual, which he or she does not enjoy doing, but in which he or she can achieve competent functioning if trained accordingly" (p. 52). Arguably, therefore, bottom character strengths could be considered deficits in that these are the strengths that do not come naturally and are likely less used than others. Consequently, the study contributed to the literature in helping to understand which is more beneficial—bolstering bottom strengths, which could be considered deficits, or developing top strengths.

Character Strengths Intervention Design

A strengths intervention is defined as a process intended to identify and develop strengths for the purpose of enhancing well-being or other favorable outcomes (Quinlan et al., 2012, p. 1147). The intervention used in the current study was developed based on a review of the literature and recommended practices. In brief, the intervention had four levels: a placebo-control group and three treatment groups. The treatment groups differed in that one group was encouraged to use their top character strengths, another to use their bottom strengths, and the third to use a combination of their top and bottom strengths. Each treatment group was instructed to select one of their top or bottom strengths and use it in a new or different way each day over the course of 2 weeks. This approach of encouraging participants to use strengths in new ways is

consistent with Seligman et al.'s (2005) original *Using Signature Strengths in New Ways* intervention that yielded increases in happiness and decreases in depressive symptoms for up to 6 months. Moreover, this particular intervention has been used in several other studies (e.g., Forest et al., 2012; Gander et al., 2013; Harzer & Ruch, 2016; Mongrain & Anselmo-Matthews, 2012; Proyer et al., 2015) with similarly encouraging results. Thus, the intervention design was aligned with previous character strengths studies.

The current study's intervention also followed the AID (attitude, identification, development) method proposed by Biswas-Diener et al. (2017), although the order in which these components were addressed was slightly different. First, study participants took the VIA character strengths survey (VIA Institute on Character, 2021a) to *identify* their strengths. Next, they watched a 15-minute video to help orient their *attitude* towards character strengths. Biswas-Diener and colleagues noted that individuals' beliefs and attitudes about their strengths could impact the efficacy of an intervention. For instance, those who perceive their strengths as malleable might be more predisposed to developing them. Consequently, the brief video provided an overview of character strengths, including what they are, why they matter, their features (e.g., they can be changed), their benefits, and examples of how participants might use their strengths in new and different ways at work. Finally, participants were encouraged to *develop* their strengths through instructions and examples for how to use them in new and different ways each day at work for 2 weeks. Additionally, during the 2-week intervention, participants received reminder messages and materials that provided them with ideas for using their strengths in different ways. Therefore, the structure of the intervention was consistent with the AID model.

Additionally, Niemiec's (2018) popular aware-explore-apply model was consulted during the intervention design. Certainly, the study intervention incorporated the *aware* element by having participants take the VIA survey (VIA Institute on Character, 2021a). However, the brevity of the intervention and its online administration made it challenging to incorporate the *explore* and *apply* elements appropriately. Niemiec described the explore phase as a period of reflection where individuals consider their strengths and connect them to past successes and experiences. The apply phase then involves setting goals and creating action plans for how to best use strengths moving forward. Arguably, participants in the current study engaged in the apply phase because they might have planned how they would use their strengths in new ways, and they did apply their strengths at work. Still, strictly speaking, the intervention did not closely adhere to Niemiec's more in-depth approach to the explore and apply phases because of its brevity and online approach.

Character Strengths and Work-Related Outcome Variables

As detailed earlier, numerous studies have examined character strengths in the workplace. As such, a range of outcome variables have been considered in association with character strengths, such as employee well-being, meaning at work (Littman-Ovadia & Steger, 2010), finding purpose in work (Harzer & Ruch, 2012), productivity, OCB, job satisfaction (Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010), creativity (Avey et al., 2012), and performance (Littman-Ovadia et al., 2017). Additionally, intervention studies have investigated the impact of character strengths interventions on outcomes such as strengths use, well-being, harmonious passion, vitality (Dubreuil et al., 2016; Forest et al., 2012), performance, (Dubreuil et al., 2016; Peláez et al., 2020), life satisfaction (Forest et al., 2012; Harzer & Ruch, 2016), positive affect, psychological capital (Meyers & van Woerkom, 2017), and work

engagement (Peláez et al., 2020). The outcome variables used in the current study (i.e., strengths use, job performance, and flourishing at work) were selected based on this prior research and by identifying additional gaps in the literature.

Strengths Use

Prior findings have suggested that participants' level of strengths use can impact outcomes (Dubreuil et al., 2016; Govindji & Linley, 2007). Therefore, it was relevant to evaluate if strengths use was affected in the current study. Additionally, in the positive psychology field, previous studies have been criticized for not measuring the variables that interventions are intended to impact (Robitschek & Spering, 2012; Wong & Roy, 2017). Consequently, a strengths intervention study should measure strengths use as a dependent variable to assess if the intervention has the desired impact. Moreover, its inclusion in this study provided further understanding of the role of strengths use in achieving desirable work-related outcomes.

Job Performance

Employee performance at work was a relevant dependent variable because the construct is a primary concern in I/O psychology (SIOP, 2021a). Additionally, prior nonexperimental studies indicated that character strengths are associated with enhanced work performance and productivity (Harzer & Ruch, 2014; Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017). However, few studies have analyzed the impact of a character strengths intervention on work performance (Dubreuil et al., 2016; Peláez et al., 2020). Moreover, those findings were mixed. Peláez and colleagues (2020) found that work performance increased after employees participated in a 5-week character strengths-based micro coaching program. However, Dubreuil and team (2016) observed no significant increases in work performance after a briefer intervention, except among the participants who reported the greatest increase in strengths use.

Consequently, the inclusion of performance as a dependent variable in the dissertation study built on prior research and contributed to scholarly knowledge regarding the impact of character strengths interventions on work performance.

Flourishing at Work

The dependent variable of flourishing at work was relevant to the study because Seligman (2011) posited that becoming aware of and using character strengths is a conduit to flourishing. Flourishing is a multi-dimensional construct based on the PERMA (positive emotions, engagement, relationships, meaning, and accomplishments) theory of well-being (Seligman, 2011). The construct is the combination of the five PERMA pillars and is considered the state achieved when an individual experiences the benefits of each PERMA element in the workplace context. Despite the proposed connection between character strengths and flourishing, few published studies have examined it. One study demonstrated that a character strengths-based psychology course increased PERMA scores for undergraduate students (Smith et al., 2020), but it did not isolate the impact of a specific character strengths intervention. Additionally, cross-sectional studies demonstrated a positive relationship between all character strengths and all PERMA dimensions among an adult sample (Wagner, Gander, et al., 2020), and that being able to use top strengths at work predicted flourishing among workers (Harzer et al., 2017). Still, these latter two studies were nonexperimental, and the connection between character strengths interventions and flourishing at work remains unknown. Therefore, this dependent variable was included in the dissertation study to advance scholarly research concerning the connection between character strengths and flourishing. In summary, the dissertation study synthesized the existing research and selected dependent variables relevant to advancing knowledge of character strengths at work.

Grounding Disciplines and Methodology

Various psychology disciplines rely on some methods more than others (Hefferon et al., 2017; Joseph & Linley, 2004; Robbins & Friedman, 2008). However, the current study's grounding disciplines of positive psychology and I/O psychology have leaned heavily on quantitative methods. As positive psychology emerged at the turn of the 21st century (Seligman, 1999) quantitative methods were emphasized—particularly experimental and longitudinal studies (Seligman & Csikszentmihalyi, 2000). Fifteen years later, a review of $N = 771$ empirical positive psychology articles revealed that 78% used quantitative methods, 10.5% used mixed methods, and 11.5% used qualitative methods (Donaldson et al., 2015). However, virtually all (99%) of the quantitative studies employed a nonexperimental, cross-sectional design. These data suggested that positive psychologists had adopted Seligman and Csikszentmihalyi's (2000) quantitative methods directive, but less so the call for experimental and longitudinal studies—likely because of the difficulty in conducting such research (Kirk, 2009). Still, any intervention study that involves manipulating an independent variable requires an experimental or quasi-experimental approach (Leedy & Ormrod, 2019). Moreover, a review of positive psychology strengths interventions indicated that several had employed an experimental approach (Duan et al., 2018; Gander et al., 2013; Harzer & Ruch, 2016; Kooij et al., 2017; Meyers et al., 2015; Proyer et al., 2013; Proyer et al., 2015; Rust et al., 2009; Seligman et al., 2005). Consequently, positive psychology places a premium on conducting quantitative studies, particularly experimental and longitudinal research designs.

I/O psychology is a well-established discipline, dating back to the 1800s (Landy & Conte, 2016). Throughout its history, the field has primarily relied on quantitative methods (Austin et al., 2002). Indeed, Landy and Conte (2016) claimed that approximately two-thirds of

I/O studies use nonexperimental designs, and Dipboye (2018) noted that the use and type of quantitative methods applied in the field had grown substantially over the last century. Furthermore, in their call for more evidence-based work in I/O psychology, Briner and Rousseau (2011) suggested that an emphasis on meta-analyses could bolster understanding of various I/O theories and concepts. Such a recommendation underscores the prominence of quantitative research in the field because meta-analyses are systematic reviews of quantitative studies (Guzzo et al., 1987). Consequently, quantitative research is conspicuous in I/O psychology. Although most I/O studies are nonexperimental (Landy & Conte, 2016), experimental research designs are still valued by the field (Dipboye, 2018).

Synthesis of Findings

The literature review yielded a rich array of prior research and revealed some shortcomings that the current study sought to address. Prominent findings from the review are synthesized in this section. First, a discussion that advances the rationale for the study's theoretical framework, the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001), is provided. This is followed by a summary of what is known and unknown about character strengths in the workplace. In combination, these discussions form the basis for the dissertation study contributing to the scholarly research and addressing a gap in the literature.

The Broaden-and-Build Theoretical Framework

Fredrickson's (1998, 2001) broaden-and-build theory of positive emotions has been used as a theoretical framework for several positive psychology studies (Lyubomirsky & Layous, 2013; Mongrain & Anselmo-Matthews, 2012). Additionally, it has been applied in organizational contexts (Cameron, 2012; Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017; Meyers & van Woerkom, 2017; van Woerkom & Meyers, 2015). Consequently, the choice to use the theory

was consistent with the study's grounding fields of positive psychology and I/O psychology. Still, beyond that, the literature suggests two specific concepts galvanize the fit between the theory and this study.

The first concept is that of agency, defined as having free will and the ability to make decisions and determine one's course in life (Bandura, 2001). Agency is a foundational concept in positive psychology because the discipline is based on the notion that humans can choose to change. Indeed, some scholars (Lyubomirsky, Sheldon, & Schkade, 2005) have suggested that genetics account for 50% of the variance for happiness (a key construct in positive psychology). Environmental factors account for 10%, leaving roughly 40% attributed to agentic behavior. Moreover, implicit in the broaden-and-build theory (Fredrickson, 1998, 2001) is the idea that individuals have agency over their emotions (Tugade & Fredrickson, 2007). Consequently, in the context of the dissertation study, one point of relevance of the broaden-and-build theory lies in the agentic nature of the intervention. Namely, it was expected that voluntary participation in the intervention could affect change in individuals' strengths use, performance, and flourishing at work.

The second concept is the role of positive emotions. Evidently, positive emotions are the crux of the broaden-and-build theory (Fredrickson, 1998, 2001), which states that positive emotions expand thought-action tendencies, undo the impact of negative emotions, and accumulate personal resources over time. Therefore, the broaden-and-build theory posits that positive emotions contribute to enhanced human functioning. As related to the dissertation topic, it was expected that learning about and using character strengths would elicit positive emotions that enable enhanced workplace success (Fredrickson, 2013). Indeed, consistent with the theory, positive affect has been identified as a mediator between strengths use and employee success and

well-being (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017; Meyers & van Woerkom, 2017; van Woerkom & Meyers, 2015). Therefore, the broaden-and-build theory was an appropriate framework for predicting and potentially explaining the outcome of the present study. Moreover, the study provided an opportunity to test the broaden-and-build theory further and provide evidence of its application to character strengths use in the workplace.

Summary of Character Strengths Research

Character strengths are a core construct of positive psychology, and they have been a central focus of numerous studies over the last 2 decades (Ghielen et al., 2018; Mayerson, 2020; Miglianico et al., 2020; Quinlan et al., 2012; Schutte & Malouff, 2019). Indeed, much is known about the associations between character strengths and favorable outcomes, such as increases in happiness and life satisfaction and decreases in depressive symptoms (Schutte & Malouff, 2019). Additionally, from an organizational perspective, character strengths have been associated with numerous positive work-related outcomes (e.g., Harzer & Ruch, 2012, 2013, 2014, 2015). However, there is much still to learn, particularly concerning character strengths interventions in the workplace and within the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001) used to ground the study.

There are several areas where the knowledge of character strengths could be expanded. First, numerous character strengths intervention studies have been completed, but few were conducted in a work context (Ghielen et al., 2018; Miglianico et al., 2020; Quinlan et al., 2012; Schutte & Malouff, 2019). Second, the work-related intervention studies that have been administered provided some encouraging results and some mixed findings. For example, Forest et al. (2012) found that a strengths intervention led to increases in harmonious passion. In contrast, Dubreuil et al. (2016) found no significant change in harmonious passion overall, but

only among those who reported the greatest increases in strengths use. Third, most strengths interventions encourage the use of an individual's top strengths, which typically leads to favorable outcomes (Harzer & Ruch, 2016; Seligman et al., 2005). But little is known about the impact of interventions designed to encourage the use of top and bottom strengths.

Only two published studies have examined the relative impact of interventions focused on top and bottom strengths (Proyer et al., 2015; Rust et al., 2009). Both studies found little difference in outcome regardless of the type of strengths participants used, and neither was conducted in a work context. Finally, there have been several calls for further research to understand better the effect of different strengths interventions (Niemiec & Pearce, 2021; Ruch et al., 2020), particularly on workplace-related outcomes (Dubreuil et al., 2016; Forest et al., 2012; Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Lavy, 2016; Peterson et al., 2010), and specifically regarding the use of strengths versus deficits (Biswas-Diener et al., 2017). Consequently, the dissertation topic synthesized these known and unknown aspects of character strengths to create a new research study that advanced scholarly knowledge and implications for practice.

Critique of Previous Research Methods

Although a relatively new area of study, character strengths have been extensively researched. Over the last 10-15 years, over 700 character strengths studies have been published (Mayerson, 2020). Still, most of this work has been nonexperimental and much is still unknown about character-strengths-based interventions (Ruch et al., 2020). Meta-analytic data suggests that character strengths interventions effectively improve well-being with small to moderate effect sizes (Quinlan et al., 2012; Schutte & Malouff, 2019). Specifically, in the work context, character strengths use is associated with significant increases in job satisfaction, work

engagement, well-being, and performance (Miglianico, 2020). However, prior work-related character strengths interventions have had strengths and limitations. This section evaluates the quality of some studies that are most relevant to the dissertation topic. The first discussion details the methodological approaches of some character strengths interventions conducted in the workplace. The second discussion examines the few intervention studies that have researched the impact of using top versus bottom strengths.

Character Strengths Interventions in the Workplace

Character strengths intervention studies conducted in a work context have revealed various strong points and limitations related to the interventions and research methods. For instance, Forest et al. (2012) tested a character strengths intervention that asked participants to identify their top strengths, visualize and describe themselves at their best, and use their signature strengths in new ways at work. Thus, the intervention was consistent with the AID model (Biswas-Diener et al., 2017) and the aware-explore-apply model (Niemiec, 2018). Additionally, the postintervention measurement was recorded 2 months later, thereby facilitating an assessment of the intervention's impact longevity. However, the study was conducted among students with part-time jobs rather than full-time employees, the control group was much smaller (n = 36) than the experimental group (n = 186), and there was no random allocation to groups. Thus, the study was quasi-experimental rather than true experimental. Finally, despite investigating the impact of using top strengths at work, the study did not include work performance as one of its dependent variables—one of the most important outcomes of organizational research (SIOP, 2021a). Still, the findings from this study were valuable. Forest and team observed that the experimental group experienced significant increases in strengths use and harmonious passion towards work, which led to enhanced life satisfaction, well-being, and

vitality. Thus, the results were encouraging, but the research design had some limitations, preventing generalizability.

Another character strengths intervention study had similar design issues and some inconclusive results. Dubreuil and colleagues (2016) administered a character strengths intervention that followed a "discovery, integration, action" (p. 6) structure akin to the aware-explore-apply model (Niemiec, 2018). The sample was $N = 73$ full-time employees at a physical rehabilitation center in Québec, and the posttest measurement was 3 months after the intervention. However, there was no control group, thereby preventing any causal conclusions about the intervention's efficacy, which was particularly troublesome because of the mixed results. Compared to the baseline measure, the postintervention scores indicated a significant increase in strengths use and well-being, but not in performance, harmonious passion, vitality, and concentration. Post hoc analysis indicated that those whose strengths use had increased the most exhibited significantly greater levels of harmonious passion and performance. Thus, the study indicated that the strengths intervention could yield positive outcomes, but only if strengths use increased substantially. One final point of limitation is that the data analysis was conducted via a series of paired sample *t* tests. However, running multiple tests on the same data can increase the chance of Type I error (Warner, 2013). Consequently, this particular study had both strengths and limitations.

Still, other studies have employed "gold standard" experimental research designs. Harzer and Ruch (2016) conducted a random-assignment, placebo-controlled, web-based intervention wherein the treatment group was encouraged to use their four top character strengths at work over a period of 4 weeks. Measurements for life satisfaction and perceiving one's work as a calling were taken at four intervals: pretest, immediately after the intervention, 3 and 6 months

later. Significant increases in calling were sustained up to 6 months, and life satisfaction also significantly increased between the pretest and 3 months and between immediately postintervention and 6 months later. Despite the intervention's efficacy, Harzer and Ruch suggested the study had some limitations, including a limited sample size (n = 53-83 in the treatment group) and a lack of understanding of whether participants' signature strengths were a good fit for their work. From an I/O psychology perspective, one might also argue that more helpful outcome variables could have been examined (e.g., performance or productivity). Therefore, in summary, a brief sampling of character strengths intervention studies indicated that high-quality methodological approaches have been used, but as with all research projects, each had its own set of limitations.

Top Versus Bottom Character Strengths Interventions

Two published studies have examined the effectiveness of encouraging participants to use top character strengths versus bottom character strengths, and both provide some contradicting evidence to the view held by some (e.g., Buckingham & Clifton, 2001; Rath & Conchie, 2009) that focusing on strengths is more beneficial. One study was conducted among a German community sample (Proyer et al., 2015) and the other among undergraduate students (Rust et al., 2009). The study by Proyer and team (2015) was an experimental, placebo-controlled, online trial measuring the impact of the intervention on happiness and depressive symptoms at pretest, posttest, 1, 3, and 6 months later. A total of N = 375 adults were randomly assigned to one of three groups for 1 week: placebo-control (journaling on early childhood memories), using top five strengths, and using five bottom strengths. Compared to the control group, both interventions yielded significant increases in happiness and decreases in depression. Additionally, participants in both intervention groups found working with strengths equally

enjoyable and beneficial. However, participants were unaware of whether they were being instructed to use their top or bottom strengths. Therefore, it is unclear whether knowing this information might have impacted these findings. Additionally, Proyer et al. noted that their sample was predominantly female (83.7%), potentially limiting generalizability. Still, overall, this was a high-quality study with few limitations.

The study by Rust and colleagues (2009) was a quasi-experimental study of $N = 108$ undergraduate students divided into three groups. One intervention group was instructed to use two of their top character strengths for 12 weeks ($n = 35$). The other intervention group was asked to use one of their top strengths and one of their bottom strengths for 12 weeks ($n = 41$). The comparison group ($n = 32$) did not engage in any intervention activity over the 12-week period. Results indicated that both intervention groups increased significantly on life satisfaction scores compared to the control group, with no significant difference in gain scores between the two interventions. Thus, the study pointed to the possibility that working on strengths and deficits can yield similar benefits. However, methodological shortcomings prevented causal conclusions. Although students were randomly assigned to one of the two intervention groups, the comparison group was not randomly assigned. Moreover, no intervention group was assigned to work only on bottom strengths, thereby precluding the possibility of further understanding the impact of developing deficits versus strengths. Additionally, the student sample limits generalizability to other populations. Yet, this study still had scientific merit and provided some evidence related to the impact of working on strengths and weaknesses. Thus, the study by Proyer et al. (2015) had more methodological rigor than that conducted by Rust et al. (2009). However, each study had merit in effectively implementing a character strengths intervention and providing directional results that could spur further research.

Summary

In summary, an extensive literature review was conducted to understand what is known and unknown about character strengths in the workplace, and more specifically, testing character strengths interventions in a work context. Much research has focused on using and applying character strengths (Ghielen et al., 2018; Quinlan et al., 2012; Schutte & Malouff, 2019). However, there is a scarcity of knowledge regarding the impact of character strengths interventions in the workplace, specifically regarding the use of strengths versus deficits (Biswas-Diener et al., 2017). Consequently, the current dissertation study sought to address this gap in the literature by conducting an experimental study to examine the impact of using top strengths, bottom strengths, and a combination of both on the outcome variables of strengths use, job performance, and flourishing at work.

Indeed, the current study aimed to contribute to knowledge of applying character strengths interventions in the workplace, the role of strengths use in outcomes, and the connection between character strengths and the multi-dimensional construct of flourishing (Seligman, 2011). Additionally, the study attempted to contribute to theory by testing the broaden-and-build theory of positive emotions (Fredrickson, 1998, 2001) to confirm its valid application in the context of character strengths use in the workplace. Furthermore, the use of an experimental research design was appropriate for answering the research question and aligned with the fields of positive psychology and I/O psychology that grounded this study. Consequently, the combination of these various research elements justified the need for the current study.

CHAPTER 3. METHODOLOGY

The current study was an experimental, longitudinal investigation. This chapter reviews the various methods and procedures used in the study. Specifically, the chapter re-states the purpose of the study, provides the research questions and their corresponding hypotheses, and outlines the research design. Additionally, the target population, sample, and protection of participants are discussed. Data collection, the instruments used, and data analysis procedures are examined. Finally, ethical issues are considered.

Purpose of the Study

This study aimed to contribute knowledge to the fields of I/O psychology and positive psychology regarding character strengths interventions in the workplace. More specifically, to answer the question, do character strengths interventions significantly impact levels of strengths use, flourishing at work, and job performance among full-time employees, ages 18-65? In exploring this question, the study sought to address the research problem that there was limited knowledge of using character strengths interventions at work, and few studies have examined whether it is more beneficial to focus on developing top or bottom strengths (Proyer et al., 2015; Rust et al., 2009). As such, this study was a response to the call from I/O researchers and practitioners for more data on whether employee development should be focused on enhancing strengths, improving deficits, or a combination of both (Biswas-Diener et al., 2017). Thus, the current study attempted to generate potential insights that could inform the application of character strengths interventions in the workplace.

Research Questions and Hypotheses

The following questions and hypotheses were explored in this study.

RQ1: Is there a statistically significant interaction effect between group and time for levels of strengths use, job performance, and flourishing at work?

H_0: There is no statistically significant interaction effect between group and time for levels of strengths use, job performance, and flourishing at work.

H_1: There is a statistically significant interaction effect between group and time for levels of strengths use, job performance, and flourishing at work.

RQ2: Is there a statistically significant difference between time points for levels of strengths use, job performance, and flourishing at work?

H_0: There is no statistically significant difference between time points for levels of strengths use, job performance, and flourishing at work.

H_1: There is a statistically significant difference between time points for levels of strengths use, job performance, and flourishing at work.

RQ3: Is there a statistically significant difference between groups for levels of strengths use, job performance, and flourishing at work?

H_0: There is no statistically significant difference between groups for levels of strengths use, job performance, and flourishing at work.

H_1: There is a statistically significant difference between groups for levels of strengths use, job performance, and flourishing at work.

Research Design

The study was a quantitative, experimental, longitudinal investigation testing the impact of different character strengths interventions. There were three dependent variables: (a) strengths

use, (b) job performance, and (c) flourishing at work. There were two independent variables. One independent variable was within-subjects (i.e., time), with three points of data collection: at baseline (T1), immediately following the 2-week intervention (T2), and 4 weeks later (T3.). The other independent variable was between-subjects (i.e., group) and had four levels: a placebo-control group and three different intervention groups. The intervention groups differed in that one group was encouraged to use their top strengths, another to use their bottom strengths, and the third to use a combination of their top and bottom strengths. Participants were randomly assigned to one of the four groups for a 2-week intervention. Moreover, within the third treatment group, random assignment was applied to ensure that approximately half the respondents in this group used a top strength in the first week and a bottom strength in the second week. The other half used a bottom strength in the first week and a top strength in the second week. Thus, an experimental research design was appropriate because participants were randomly assigned to one of four groups, there was a control group, and the causal effect of the interventions was investigated (Warner, 2013). Table 3 provides a visual representation of the study design.

Table 3

Longitudinal and Experimental Research Design

Design	T1 (Pretest)	Intervention (2 weeks)	T2 (Posttest 1) (T1 + 2 Weeks)	T3 (Posttest 2) (T1 + 6 weeks)
Pretest-Posttest	O R	X_1	O	O
Randomized	O R	X_2	O	O
Experimental	O R	X_3	O	O
	O R	X_4	O	O

Note. O = observation; R = random allocation to groups; X_1 = placebo; $X_{2\text{-}4}$ = strengths interventions.

Target Population and Sample

The target population was full-time employees, ages 18-65, located in the United States. The sample for this population was recruited from Amazon Mechanical Turk (MTurk; Amazon Mechanical Turk, 2018) via CloudResearch (formerly TurkPrime; CloudResearch, 2021). A power analysis was performed in G*Power (Faul et al., 2007) to ascertain the minimum required sample size. The population, sample, and power analysis are discussed in more detail in this section.

Population

The population for this study was full-time employees, ages 18-65, located in the United States. Estimates for this population from 2019 were retrieved from the U.S. Census Bureau (n.d.-c). Of the total U.S. population, 61.3% are aged 18-64, 51.3% are female, 72% are White, 12.8% are Black, 5.7% are Asian, and 18.4% are Latino (U.S. Census Bureau, n.d.-b). Employment data are only reported for individuals ages 16 and above. Per that data, 63.6% of the age 16+ population is in the labor force, and slightly less than half (47.4%) are female (U.S. Census Bureau, n.d.-a).

Sample

The sample for the study was drawn from MTurk (Amazon Mechanical Turk, 2018) via CloudResearch (2021). MTurk was established in 2005 by Amazon to create an online platform where people could be paid to test or solve problems that computers could not handle. Such tasks are referred to as Human Intelligence Tasks (HITs), and the individuals who perform these tasks are described as “MTurk workers” (Litman & Robinson, 2021). These workers are not employed by MTurk or Amazon. Rather, they are independent individuals who voluntarily participate on the platform and perform HITs as they choose in exchange for monetary incentives. Once an

individual registers as an MTurk worker, they are assigned a worker identification, more commonly referred to as a worker ID, which is used to maintain their anonymity on the platform.

Since 2010, MTurk (Amazon Mechanical Turk, 2018) has become a popular recruiting source for academic researchers because of the reasonable cost to access a large and divergent participant pool (Aguinis et al., 2021). However, in recent years, the data quality of MTurk has been questioned due to issues such as fraudulent or inattentive participants (Kennedy et al., 2020). CloudResearch (2021) offers a solution to these data quality problems. It is a website that verifies MTurk workers and vets them for attention and engagement in academic studies (Litman & Robinson, 2021). Consequently, CloudResearch allows researchers to field their studies on MTurk with the reassurance that the data collected will be of high quality. Recent data from the CloudResearch database indicated that 226,000 of the 250,810 active MTurk workers were U.S.-based. Almost all of them were between the ages of 18-65 (94.0% were aged 18-59), and 68% were employed (Litman & Robinson, 2021).

Thus, the sample for the study was drawn from the U.S.-based MTurk (Amazon Mechanical Turk, 2018) worker population who were full-time employees, ages 18-65, and who had been vetted by CloudResearch (2021) as approved research participants. Additional inclusion criteria required participants to have daily access to high-speed Internet because the intervention and all data collection were administered online. Moreover, participants had to have a minimum 95% approval rate for all HITs performed and completed at least 5,000 HITs. These specific MTurk performance criteria were implemented as a best practice for increasing the retention rate for longitudinal projects (Litman & Robinson, 2021). There were no exclusion criteria. If potential respondents did not meet all of the inclusion criteria, they could not participate.

Sample demographic data were only available for all MTurk (Amazon Mechanical Turk, 2018) workers, and not among the specified population of workers ages 18-65 and employed full-time. Across all MTurk workers, recent estimates showed that 57.7% are female, 29.7% ages 18-29, 36.8% ages 30-39, 16.8% ages 40-49, 10.7% ages 50-59, and 6.0% ages 60-69. Additionally, 79.9% identify as White, 9.1% as Black, 11.0% as Asian, 20.4% as Hispanic, and 1.0% as some other race or ethnicity. Finally, 52.9% of all MTurk workers have no college degree, 35.1% have a college degree, and 12.0% have a postgraduate degree (Litman & Robinson, 2021).

Power Analysis

The minimum total sample size required for this study was $N = 124$ participants. This sample size was calculated using a power analysis. Specifically, using G*Power (Faul et al., 2007), and assuming the use of a two-way mixed analysis of variance (ANOVA), a medium effect size of .25, statistical power of .80, an alpha level of .05, four groups (1 x control, 3 x treatment), and three measures (1 x pretest, 2 x posttest), the minimum total sample size calculated was $N = 124$. Therefore, approximately $n = 31$ participants were needed in each group. However, attrition and missing data rates of up to 70% to 80% had been noted in other Internet-based strengths interventions (Mitchell et al., 2009). Additionally, Litman and Robinson (2021) claimed that a meta-analysis of more than 1,200 longitudinal studies fielded via CloudResearch (2021) yielded an average attrition rate of 32%. Consequently, the expected attrition rate was expected to range from 32% to 80%. Therefore, the goal was to recruit $N = 400$ participants to ensure a final minimal sample size of at least $N = 124$.

Procedures

The study involved a series of procedures regarding participant selection, data collection, and data analysis. Additionally, there was the process of administering the intervention. Each of these study elements is discussed in-depth in this section.

Participant Selection

The study employed a nonprobability sampling strategy and a convenience sampling design. The reason for this strategy and design was that participants were recruited online from MTurk (Amazon Mechanical Turk, 2018) via CloudResearch (2021). Consequently, only MTurk workers vetted by CloudResearch had the opportunity to participate in the study (i.e., the study would not be open to all MTurk workers nor all employees, ages 18-65). As such, this was a nonprobability sampling strategy (Trochim, 2021). Additionally, participants were recruited on a volunteer basis after reviewing a brief description of the study posted as a HIT on MTurk. Therefore, this design was an "I'll take who I can get" approach, which is classified as convenience sampling (Etikan et al., 2016). Thus, by using volunteer recruitment from MTurk via CloudResearch, the sampling strategy was nonprobability, and the design was convenience sampling.

Participants were recruited online from MTurk (Amazon Mechanical Turk, 2018) via CloudResearch (2021). An initial HIT was created for the study, including a brief description of the study purpose, length, tasks, and incentive. The HIT was made visible to potential U.S.-based participants on MTurk who met the inclusion criteria noted above: (a) ages 18-65, (b) employed full-time, (c) a minimum 95% approval rate for all HITs performed, and (d) completed at least 5,000 HITs. Those who opted-in clicked on a URL taking them to three short screening questions:

1. Are you between the ages of 18-65?
2. Are you currently employed full-time?
3. Do you have daily access to high-speed Internet and a computer on which you can watch and listen to video content?

Volunteers who answered "no" to any of the three questions were ineligible, thanked, and excluded from the process. Individuals who answered "yes" to all three questions were qualified to participate. Subsequently, these qualified volunteers were presented with an online informed consent form and asked to click on a radio button after reviewing it to indicate their willingness to participate. If potential participants had questions about the study, they could contact the researcher by email, which was provided in the informed consent form. Those who reviewed the informed consent form and chose not to participate were terminated from the process. Those who indicated their willingness to participate proceeded into the study.

Protection of Participants

Participants were protected during sampling and recruitment by the use of voluntary participation, informed consent, and measures to ensure anonymity and confidentiality per the American Psychological Association (APA, 2017) standards and Belmont Principles (U.S. Department of Health, Education, and Welfare, 1979). Voluntary participation was assured by the convenience sampling design, which meant that participation was only possible by volunteering (Trochim, 2021). Additionally, participants were able to withdraw from the study at any time simply by stopping participation or requesting to be removed.

Informed consent was secured by a two-step process. First, volunteers who chose to participate in the study were taken to the initial questionnaire to answer screening questions that evaluated eligibility (i.e., ages 18-65, employees who work full-time, daily access to high-speed

Internet). Ineligible volunteers were thanked and terminated from the process. Next, eligible potential participants proceeded to another webpage where the study's full details were provided. After reading through all the details, potential participants were asked to click *I consent*, or *I do not consent*. Those who did not consent were thanked and removed from the study. Those who selected *I consent* indicated their desire to participate and proceeded to the next phase of the study. Thus, informed consent was explicitly obtained prior to any participation in the study.

Once informed consent was granted, participants were asked to enter their MTurk (Amazon Mechanical Turk, 2018) worker ID at the beginning of each point of data collection. The use of MTurk worker IDs was included in the informed consent details. Participants were assured that their MTurk worker IDs would only be used for communication and matching data across the various points of collection. Thus, anonymity and confidentiality were maintained. After all the data had been collected and matched, the MTurk worker IDs were removed from the main data file and stored in a separate file on a secure computer and hard drive. Consequently, various measures were used during the sampling and recruitment process to protect participants' volunteer status, anonymity, and confidentiality.

Data Collection

Data were collected online using questionnaires hosted by Promark Research Corporation (n.d.-a) and at a website developed for this study (http://thecsresearchstudy.org/), which housed the VIA character strengths assessment (VIA Institute on Character, 2021a) and intervention materials. This custom website was hosted by Eicra (2019). There were three points of data collection: at baseline (T1), immediately following the 2-week intervention (T2), and 4 weeks later (T3). Four HITs were posted on MTurk (Amazon Mechanical Turk, 2018) via CloudResearch (2021) for data collection and intervention administration.

Subsequent to the screening questions and informed consent, HIT 1 (T1 data collection) included the VIA character strengths assessment (VIA Institute on Character, 2021a), the baseline questionnaire, and the first week of intervention content and instructions. After providing informed consent, each participant was presented with the baseline questionnaire, which first included the demographic questions (MTurk worker ID, gender, age, state of residence, and occupation) and the strengths assessment. Participants were instructed to leave the Promark (n.d.-a) survey webpage open while they took the strengths assessment at http://thecsresearchstudy.org/. Upon completion of the strengths assessment, participants returned to the Promark survey webpage and uploaded the PDF report of their strengths assessment results. Next, they completed the rest of the initial questionnaire, including the following scales, in this order: Strengths Use Scale (Govindji & Linley, 2007), In-Role Behavior Work Performance Scale (Williams & Anderson, 1991), and flourishing at work, as measured by the Workplace PERMA Profiler (Kern, 2014).

After completing the initial questionnaire, participants were randomly assigned by the Promark Research (n.d.-a) platform to the intervention and control groups (approximately 25%/25%/25%/25% distribution). Additionally, within the intervention group that was asked to use top and bottom strengths (see Intervention Procedures below), a further level of random allocation was used. Approximately half of this group was assigned to use their top strengths during the first week of the intervention and their bottom strengths during the second week. The other half was assigned to use their bottom strengths in the first week and their top strengths in the second week.

After the first week of the intervention, all participants were presented with HIT 2, which provided the instructions for the second week of the intervention and asked some attention check

questions about it. These questions were not used in the data analysis, and therefore, this HIT was not technically a point of data collection. However, it is included here to provide a complete chronological accounting of the HITs posted on MTurk (Amazon Mechanical Turk, 2018) via CloudResearch (2021).

Upon completion of the 2-week intervention, all participants were presented with HIT 3 (T2 data collection), which was the first posttest questionnaire, including MTurk (Amazon Mechanical Turk, 2018) worker ID, and the following scales, in this order: Strengths Use Scale (Govindji & Linley, 2007), In-Role Behavior Work Performance Scale (Williams & Anderson, 1991), and the Workplace PERMA Profiler (Kern, 2014). Four weeks later, all participants were asked to complete HIT 4 (T3 data collection), which was the second posttest questionnaire, including MTurk worker ID, and the following scales, in this order: MTurk worker ID (for data-matching purposes), Strengths Use Scale (Govindji & Linley, 2007), In-Role Behavior Work Performance Scale (Williams & Anderson, 1991), and the Workplace PERMA Profiler (Kern, 2014). Thus, data were collected at three time intervals over 6 weeks using four HITs on MTurk. MTurk worker IDs were used to match the data collected during each HIT at each time interval.

Intervention Procedures

There were four groups in the research design—three intervention groups and one placebo-control group—that participated in a 2-week program. The intervention groups were encouraged to use (a) their top character strengths, (b) bottom character strengths, or (c) a combination of top and bottom character strengths. A participant's top and bottom strengths were identified when an individual took the VIA character strengths assessment (VIA Institute on Character, 2021a), hosted at http://thecsresearchstudy.org/, and received a personalized report ranking all 24 character strengths. Top strengths, also referred to as signature strengths, are the

three to seven top-ranking strengths that "a person owns, celebrates, and frequently exercises" (Peterson & Seligman, 2004, p. 18). Bottom strengths, also known as lesser strengths, are the three to seven lowest-ranking strengths that an individual expresses or uses to a lower degree (Proyer et al., 2015).

All groups completed the baseline questionnaire and the VIA character strengths assessment (VIA Institute on Character, 2021a). The placebo-control group received instructions to keep a daily journal of early memories, an exercise used in other placebo-controlled positive psychology studies (e.g., Gander et al., 2013; Proyer et al., 2015; Seligman et al., 2005). The three strengths intervention groups watched a 15-minute video providing an overview of character strengths, including what they are, why they matter, their features, their benefits, and examples of how participants might use their strengths in new and different ways at work. Respondents were unable to fast-forward or skip past the video. After the video, each group received the following instructions based on prior interventions (Proyer et al., 2015; Seligman et al., 2005). The exact language used for the intervention instructions is provided in the appendix.

1. Intervention Group 1: This group was encouraged to use top strengths in different ways at work. Participants were directed to select one top strength to focus on for the first week and a different top strength in the second week.
2. Intervention Group 2: This group was encouraged to use bottom strengths in different ways at work. Participants were instructed to select one bottom strength to focus on for the first week and a different bottom strength in the second week.
3. Intervention Group 3: This group was encouraged to use both top and bottom strengths in different ways at work. Participants in this group focused on the use of top strengths for 1 week and bottom strengths for the other week. Instructions were

similar to those used for groups 1 and 2 above. Random assignment was used to ensure that approximately half the respondents in this group were allocated to use a top strength in the first week and a bottom strength in the second week. The other half were assigned to use a bottom strength in the first week and a top strength in the second week.

Intervention Materials

Intervention materials were housed on the Promark Research Corporation (n.d.-a) platform and at http://thecsresearchstudy.org. The materials were in the form of a prerecorded video and instructions, worksheets, and examples of how to use character strengths in different ways provided as PDF documents. The video was uploaded and stored on the researcher's Vimeo (Vimeo.com, Inc., 2021) account. From there, the video was embedded into Promark's platform. The links used to embed the video were private so that only study participants accessing the intervention were able to watch the video (i.e., no visitors to the researcher's Vimeo account were able to see the intervention video).

Intervention materials were made available at the beginning of Week 1 (T1/HIT 1) and the beginning of Week 2 (HIT 2). Notification of and access to new content was provided to participants using CloudResearch's (2021) messaging system, which allows researchers to communicate with participants using only their MTurk (Amazon Mechanical Turk, 2018) worker IDs. Additionally, two reminder messages were sent during each week of the 2-week intervention program to encourage participation.

Intervention Incentives

Incentives were used to encourage participation and reduce the rate of attrition, which was expected to range from approximately 30% to 80% (Litman & Robinson, 2021; Mitchell et

al., 2009). The standard and expected incentive rate on MTurk (Amazon Mechanical Turk, 2018) was $6 per hour for a HIT. Additionally, participant retention was crucial to the study design. Therefore, best practices for longitudinal studies on MTurk were adopted. These included offering a stable or increasing incentive rate for each HIT (Litman & Robinson, 2021). The total incentive amount for the study was $26.00, which was divided across the four study HITs as $6 for the first three HITs and $8 for the fourth HIT.

This incentive amount and structure were derived from the literature (Litman & Robinson, 2021) and through direct consultation with CloudResearch (A. Dietrich, personal communication, April 12, 2021). The estimated time for completing the first HIT (i.e., screening questions, informed consent, character strengths assessment, baseline questionnaire, Week 1 intervention materials) was 1 hour. Therefore, participants were paid $6 for the first HIT, as recommended by Litman and Robinson (2021). Each of the following three HITs required approximately 15 minutes to complete. The second HIT was administered during the midpoint of the intervention, asking participants to log on to receive instructions for Week 2 of the intervention. The third and fourth HITs were the two posttest questionnaires administered at the end of Weeks 2 and 6, respectively. Based on the recommended hourly incentive, it might have seemed logical to only pay participants $1.50 for each of these three HITs. However, the dramatic decline from $6 at the baseline to $1.50 for subsequent HITs was expected to impact the retention rate adversely. Moreover, there was a 4-week break between the two posttest questionnaires (HITs 3 and 4), which could have resulted in even further attrition (A. Dietrich, personal communication, April 12, 2021). Consequently, given the longitudinal design, each of the first three HITs was valued at $6 each and the final HIT at $8 to incentivize participants to continue with the study and complete all four HITs over the 6-week period.

Data Analysis

Data analysis was conducted methodically using a step-by-step process. First, the raw data were organized by importing them from the data collection platform (i.e., Promark Research Corporation, n.d.-a) in a Microsoft Excel (Microsoft, 2021) file to IBM SPSS v26.0 (IBM, n.d.). There were three time intervals for data collection (T1 = baseline; T2 = 2 weeks later, upon completion of the intervention; T3 = 4 weeks after completion of the intervention). Consequently, data from each of these collections were matched through use of MTurk (Amazon Mechanical Turk, 2018) worker IDs, so that each respondent record had three sets of data. Once the records were matched, a number was assigned to each respondent, and the identifying information (i.e., MTurk worker ID) was removed and stored in a separate file on a secure computer and hard drive. The subsequent steps are detailed in the following sub-sections.

Descriptive Statistics

The next step of the data analysis process included data screening and analysis of the descriptive statistics to prepare the data for analysis. The descriptive statistics included histograms, mean scores, standard deviations, skewness and kurtosis scores, and the Shapiro-Wilk's test of normality for each dependent variable for each data set (i.e., T1, T2, T3). However, before performing these descriptive statistics, several aspects of data preparation were performed. First, as recommended by Warner (2013), a manual line-by-line review of the full data set was conducted to identify any missing cases, errors, or unusual values. Next, frequency counts were performed for each variable for confirmation. Missing data or errors were addressed by listwise deletion.

Second, a series of questions were examined to locate any respondents who might have demonstrated insufficient attention or effort. This procedure involved examining a series of

bogus, attention check, and instructional manipulation questions that were embedded in the questionnaires and intervention. (These items are discussed in detail in the Instruments section.) Participants who failed to respond appropriately to these questions were removed from the data. Additionally, some reverse-coded items were used to identify inattentive or careless respondents. Specifically, if respondents offered similar responses to some questions in the In-Role Behavior Work Performance Scale (Williams & Anderson, 1991), they were flagged as disengaged and removed from the data. These questions included two items that described an individual's performance positively and two items that items that described an individual's performance negatively. Therefore, if a participant provided similar responses to these opposite-meaning questions, they were considered inattentive. Thus, various measures were taken to ensure the quality of the data.

The data analyzed were all continuous data. The three dependent variables (strengths use, job performance, and flourishing at work) were measured using Likert scales. While Likert scales are technically classified as an ordinal level of measurement, they are treated as interval data for the data analysis purposes (Warner, 2013). Finally, a mean score for each respondent for each dependent variable was calculated. For the Strengths Use Scale (Govindji & Linley, 2007), this involved calculating the mean score for all 14 items. For the In-Role Behavior Work Performance Scale (Williams & Anderson, 1991), two items had to be reverse-coded, and then the mean score was calculated for all seven items on the scale. For the scale used to measure flourishing at work (i.e., the Workplace PERMA Profiler; Kern, 2014), a mean score for 16 items on the scale was calculated. This process of calculating mean scores was completed for each dependent variable for each set of data (i.e., T1, T2, T3).

After these initial data management procedures, the descriptive statistics were analyzed to assess the dependent variables for normal distribution. Normal distribution is a foundational assumption for any parametric test, including the two-way mixed ANOVA used in this study (Verma, 2016). Data transformation was used to remedy violations of normality. The remaining parametric assumptions were performed during the hypothesis testing phase. Table 4 summarizes the study variables and their data type.

Table 4

Variables by Data Type

Variable	IV/DV	Data Type
Groups (3 x intervention, 1 x placebo-control)	IV	Categorical
Time (T1, T2, T3)	IV	Categorical
Strengths use	DV	Interval
Job performance	DV	Interval
Flourishing at work	DV	Interval

Note. IV = independent variable; DV = dependent variable; T1 = baseline measurement; T2 = first posttest measurement, immediately after the 2-week intervention; T3 = second posttest measurement, 4 weeks after the intervention.

Hypothesis Testing

The inferential statistical procedure used in the data analysis was a two-way mixed ANOVA for each dependent variable. This procedure was appropriate for answering the research questions because it allowed for analysis of each dependent variable within and between three or more groups for repeated measures (Verma, 2016). Namely, at the three time intervals before and after the interventions. Assumption tests for this statistical procedure were performed, and any violations were appropriately addressed prior to analysis.

Several assumptions must be met for a two-way mixed ANOVA. The first three are related to the study design, and the others were statistically tested. The assumptions related to study design are that (a) there is one dependent variable, measured as continuous data, (b) there

is one categorical between-subjects factor that consists of two or more categorical, independent groups, and (c) there is one categorical within-subjects factor that consists of two or more categorical, independent groups (Verma, 2016). All these assumptions were met in the study design. The assumptions that were statistically tested included (d) there are no outliers, (e) the dependent variable demonstrates normality, (f) there is an adequate sample size, (g) there is homogeneity of variances, (h) there is homogeneity of variance-covariance matrices, and (i) there is no sphericity (Laerd Statistics, n.d.-c; Verma, 2016). Therefore, these assumptions were tested using the appropriate statistical methods prior to conducting or in conjunction with each two-way mixed ANOVA.

The six assumptions that could be tested statistically were performed as follows. Outliers were evaluated in two ways. First, boxplots were generated for the dependent variables to assess if outliers were present. Next, *z* scores were generated in IBM SPSS v26.0 (IBM, n.d.) for each of the variables by intervention group to identify participants with values outside ± 3 standard deviations from the mean. Normality was determined by the descriptive statistics noted above (i.e., histograms, skewness and kurtosis scores, and the Shapiro-Wilk test of normality). Adequate sample size was determined by examining the frequency counts for each cell of the study. Per Verma (2016), at least $n = 20$ cases were required in each cell for robustness in the two-way mixed ANOVA test. Homogeneity of variances was evaluated by the Levene test. Homogeneity of variance-covariance matrices was assessed by Box's *M* test, and sphericity was examined with Mauchly's *W* test. These last three tests were all run concurrently with the ANOVAs.

After reviewing that each of the testable assumptions had been met, the researcher performed a series of two-way mixed ANOVAs in IBM SPSS v26.0 (IBM, n.d.); one for each

dependent variable. This test measures for a significant interaction between time and group. If a significant interaction is found, simple main effects are subsequently reviewed for time and group. If no significant interaction is detected, main effects for time and group are reported (Verma, 2016).

Ad Hoc Analysis

The two-way mixed ANOVA is an omnibus test that can only determine if a statistically significant interaction effect exists between the independent variables on the dependent variables. Therefore, to evaluate the exact statistically significant differences for each dependent variable, ad hoc tests were conducted. These were performed using the Tukey honestly significant difference (HSD) and Bonferroni correction tests to help reduce the risk of Type I error that can be inflated when multiple tests are performed on the same data (Warner, 2013). Table 5 summarizes the descriptive statistics, hypothetical testing, and ad hoc analysis for the study.

Table 5

Descriptive Statistics, Hypothesis, and Ad Hoc Testing

Research Question No.	Type of Analysis	Descriptive Statistics	Hypothesis Testing	Ad Hoc Analysis
1-3	Two-way mixed ANOVA	Histograms Mean scores Standard deviations Skewness Kurtosis Shapiro-Wilk's test of normality	$p < .05$ Boxplots Frequency counts Levene's test for equality of variances Box's *M* test Mauchly's *W* test Two-way mixed ANOVA *F* test One-way ANOVA (if simple main effects analyzed) Repeated measures ANOVA (if simple main effects analyzed)	$p < .05$ Tukey honestly significant difference (HSD) Bonferroni correction

Note. Research questions 1-3 used similar statistical procedures.

Instruments

Three preexisting instruments were used to measure the dependent variables of strength use, job performance, and flourishing at work. Additionally, attention check and manipulation questions were included at each data collection point and in the administration of the intervention to mitigate the possibility of disengaged respondents. The instruments and these additional questions are reviewed in this section. Table 6 provides an overview of the instruments, the variables measured, and the data type collected.

Table 6

Instruments Used to Measure Dependent Variables

Instrument	Dependent Variable	Data Type
Strengths Use Scale	Strengths use	Interval
In-Role Behavior Work Performance Scale	Job performance	Interval
Workplace PERMA Profiler	Flourishing at work	Interval

Note. Strengths Use Scale authored by Govindji and Linley (2007); In-Role Behavior Work Performance Scale authored by Williams and Anderson (1991); Workplace PERMA Profiler authored by Kern (2014).

Strengths Use Scale

Permission to use the Strengths Use Scale (Govindji & Linley, 2007) was provided by the author, Alex Linley (A. Linley, personal communication, March 19, 2020). The strengths use instrument is a 14-item scale that presents statements describing different experiences in using strengths. Participants respond to each item using a 7-point Likert-type scale that ranges from the lowest score of 1, which represents a response of *strongly disagree*, to the highest score of 7, which represents a response of *strongly agree*. The lower the score for each item on this scale, the less likely it is that an individual has much opportunity to use his/her strengths. Conversely, the higher the score for each item on the scale, the more likely it is that a respondent perceives multiple opportunities to use strengths.

An overall mean score for the 14 items on the scale is usually calculated for data analysis purposes. Prior studies conducted among English-speaking employees indicated that the overall strengths use mean score ranged from 3.24 to 5.54 (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017). Therefore, it was reasonable to suggest that a low overall mean score on this scale would be in the range of 1-2 (i.e., low strengths use), and a high overall mean score on this scale be 6-7 (i.e., high strengths use).

Validity

Statistics for construct, criterion, and predictive validity were available for the Strengths Use Scale (Govindji & Linley, 2007). Construct validity was examined in developing the instrument and during later testing. Govindji and Linley (2007) used a principal components analysis of the 14 items comprising the scale. They found that the items loaded between .52 to .79 on a strengths use factor that represented 56.2% of the variance. Additionally, Wood et al.

(2011) used a factor analysis to confirm that all 14 items of the scale should be retained and used to form a single score. Specifically, only the first eigenvalue had a value greater than 1, and when it was extracted, all items loaded above .66, and all but one loaded above .77. Consequently, this second study provided further evidence of the one-factor solution of the Strengths Use Scale (Govindji & Linley, 2007).

Criterion and predictive validity were tested in the later study by Wood and colleagues (2011). Criterion validity was examined by exploring the relationship between strengths use and different aspects of well-being. The strengths use scale was positively correlated with self-esteem (r = .50), vitality (r = .54), positive affect (r = .52), and negatively correlated with negative affect (r = -.25), and stress (r = -.31). All of these correlations were significant (p < .001). Predictive validity was examined by a series of multiple regressions testing the study's primary hypothesis that strengths use would predict well-being over time. Results showed that at both 3 months and 6 months, strengths use significantly predicted an increase in self-esteem, vitality, and positive affect, and a decrease in stress (all p < .05), but not negative affect. Thus, the two studies provided evidence that the Strengths Use Scale (Govindji & Linley, 2007) has good construct, criterion, and predictive validity.

Reliability

Statistics related to internal and test-retest reliability were available for the Strengths Use Scale (Govindji & Linley, 2007). Internal reliability of the instrument was measured using Cronbach's alpha. In the first study, Govindji and Linley (2007) reported a Cronbach's alpha score of α = .89. In the second study, Wood et al. (2011) reported Cronbach's alpha scores of α = .97, α = .97, and α = .94 at three time periods (i.e., at baseline, after 3 months, and after 6 months). In general, a Cronbach's alpha score of α = .70 is acceptable, with higher scores

considered to be even better (Warner, 2013). Thus, across both studies that tested the Strengths Use Scale (Govindji & Linley, 2007), satisfactory internal reliability was observed. Additionally, Wood et al. (2011) examined test-retest reliability and found that across the three time intervals, the agreement was significant (F [206, 412] = 6.56, $p < .001$), and very high ($r_{icc} = .85$).

In-Role Behavior Work Performance Scale

The In-Role Behavior (IRB) Work Performance Scale (Williams & Anderson, 1991) was used to measure job performance. Permission to use the scale in the self-report form was provided by the primary author, Larry Williams (L. D. Williams, personal communication, March 19, 2020). The IRB work performance instrument is a 7-item scale presenting statements related to an individual's job performance. Each item is rated using a 5-point Likert-type scale. The lowest score is 1, representing a response of *strongly disagree*, and the highest score is 5, which represents a response of *strongly agree*. The lower the score for each item on this scale, the lower an individual's performance at work. By contrast, the higher the score for each item on the scale, the greater an individual's performance at work.

An overall mean score for the seven items on the scale is usually calculated for data analysis purposes. Previous studies conducted among English-speaking employees demonstrated that the overall IRB work performance mean score was 4.36 (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017). Thus, it was reasonable to suggest that a low overall mean score on this scale would be in the range of 1-2 (i.e., low in-role behavior work performance), and a high overall score on this scale would be 5 (i.e., high in-role behavior work performance).

Validity

Statistics for construct, convergent, and divergent validity were available for the IRB Work Performance Scale (Williams & Anderson, 1991). Construct validity was examined by a

factor analysis of the seven items comprising the scale and 16 items representing two scales for organizational citizenship behavior (OCB). The authors found that the IRB items loaded at .52 to .88 on a single IRB factor that accounted for 39.9% of the total variance. Moreover, the factor analysis demonstrated divergent validity in that the single IRB factor was distinct from the OCB scales. Additionally, Williams and Anderson (1991) considered convergent validity by analyzing the correlations between the IRB factor and the two OCB factors, finding significant ($p < .05$) positive associations ($r = .52$ and $r = .55$). Thus, Williams and Anderson found that while the IRB Work Performance Scale was convergent with other scales that measure work performance (OCB), they also provided evidence that IRB was distinct from these scales, and that it measured a separate aspect of performance.

Reliability

Statistics related to internal reliability were available for the IRB Work Performance Scale (Williams & Anderson, 1991). The instrument's internal reliability was measured using Cronbach's alpha, which was reported at $\alpha = .91$ (Williams & Anderson, 1991), greater than the acceptable value of $\alpha = .70$ (Warner, 2013). Additionally, in other studies where the scale was used as a supervisor rating of subordinate performance, the internal reliability was reported as $\alpha = .80$ (Greguras & Diefendorff, 2010), and $\alpha = .88$ (Rasheed et al., 2015). In two studies where a self-report version of the scale was used among global samples of working adults, the internal reliability was reported in both as $\alpha = .86$ (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017). Consequently, whether used as a supervisor rating or self-report scale, the IRB Work Performance Scale demonstrated satisfactory internal consistency.

Workplace PERMA Profiler

The Workplace PERMA Profiler (Kern, 2014) was used to measure the variable of flourishing at work. Per Kern (2014), the measure is accessible for noncommercial research purposes once a researcher fills out a brief online form. Thus, permission to use this scale was granted by submitting the required form to its author, Margaret L. Kern. The Workplace PERMA Profiler is a 23-item questionnaire comprising three items measuring each of the five PERMA pillars (positive emotions, engagement, relationships, meaning, and accomplishment). There are eight filler items: three for negative emotions, three for health, one for loneliness, and one for overall happiness. Respondents use 11-point Likert-type scales to score each item. Zero is the lowest possible score, and it represents the responses of *not at all*, *never*, or *terrible*. The highest score on the scale is 10, which represents the responses of *completely*, *always*, or *excellent*.

The overall measure of flourishing at work was operationalized by calculating the mean score of the 15 items used to measure the five PERMA pillars and one general measure of happiness. A lower overall flourishing mean score indicates that an individual is languishing or not flourishing. A higher overall flourishing mean score indicates a state of well-being or flourishing. In a prior study conducted among German-speaking employees, where the Likert scale ranged from 1 (*not at all*/*never*/*terrible*) to 11 (*completely*/*always*/*excellent*), the overall flourishing at work mean score was 7.75, with a minimum of 3.25 and a maximum of 10.38 (Harzer et al., 2017). Consequently, it was logical to assume that a low overall flourishing at work mean score using Kern's (2014) 0-10 scale would be in the range of 0-5 (i.e., languishing), and a high overall flourishing at work mean score would be in the range of 9-10 (i.e., flourishing).

The English-language Workplace PERMA Profiler (Kern, 2014) is a modified version of the original English-language PERMA-Profiler that was developed by Butler and Kern (2016). To create the Workplace PERMA Profiler (Kern, 2014), several of the 23 items of the PERMA-Profiler were adjusted so that respondents would answer the question in the context of work rather than general life. For example, terms such as *at work*, *work-related*, and *coworkers* were added to items to modify the meaning and provide a work focus in the Workplace PERMA Profiler. Normative data and information related to validity and reliability for the English-language Workplace PERMA Profiler are limited. However, the original English-language PERMA-Profiler from which it was adapted underwent extensive testing, and the Workplace PERMA Profiler has been translated into German, Korean, and Japanese. Each of these other-language versions of the instrument has demonstrated good validity and reliability. Consequently, there is supportive evidence for reasonable validity and reliability of the English-language Workplace PERMA Profiler.

Validity

No validation data is available for the English-language Workplace PERMA Profiler (Kern, 2014). However, Butler and Kern (2016) tested the PERMA-Profiler for content, convergent, and divergent validity. Content validity was tested by compiling more than 700 items that could be used to measure the five PERMA elements of flourishing. Three positive psychology experts rated these items, and after further assessment and discussion, the list was reduced to 109 items (33 positive emotion, 23 engagement, 21 relationships, 15 meaning, 17 accomplishment). These items, along with some other scales (to be used for convergent and divergent validity), were tested among a sample of $N = 3751$ adults from around the world. Through principal components analysis, Butler and Kern were able to reduce the number of

items to 15 (three for each PERMA domain). Subsequently, the 15-items were tested in a confirmatory factor model, which demonstrated acceptable fit (i.e., a root mean square error of approximation of less than .06 combined with a standardized root mean residual below .09). Thus, content validity was tested by a multi-step process.

Convergent and divergent validity were first explored by examining each factor's relationship with the additional scales administered to the sample of N = 3751 adults. The PERMA factors were strongly correlated with other measures for flourishing (r = .64 to r = .81), life satisfaction (r = .53 to r = .73), and PAC-10 (a measure of project and goal meaning and benefit) (r = .62 to r = .75). They were moderately correlated with physical health (r = .31 to r = .41), and inversely correlated with negative emotion (r = -.34 to r = -.49) and loneliness (r = -.29 to r = -.55). These directional correlations were as expected and provided some evidence of convergent and divergent validity. These convergent and divergent validity results were further confirmed and tested against other constructs in the subsequent eight different samples used to provide psychometric and norming data (N = 31,965). Consequently, through numerous tests and different samples, evidence for content, convergent, and divergent validity was generated for the PERMA-Profiler (Butler & Kern, 2016).

To date, no validity tests for the Workplace PERMA Profiler (Kern, 2014) have been conducted for the English-language version of the instrument. However, studies conducted in Japan and Korea to test the validity of translated versions of the instrument have demonstrated good validity through confirmatory factor analyses. Watanabe et al. (2018) found that a Japanese version of the Workplace PERMA Profiler demonstrated a marginally acceptable fit for the 5-factor PERMA model (i.e., a root mean square error of approximation of .105 combined with a standardized root mean residual of .051). Choi and colleagues (2019) had similar results with a

Korean version of the instrument (i.e., a root mean square error of approximation of .110 combined with a standardized root mean residual of .054). Thus, while no validity statistics are available for the English-language version of the Workplace PERMA Profiler, there is evidence of reasonable validity for the instrument when translated to other languages and for the original PERMA-Profiler (Butler & Kern, 2016).

Reliability

Internal and test-retest reliability of the PERMA-Profiler (Butler & Kern, 2016) was available, as well as internal reliability of the Workplace PERMA Profiler (Kern, 2014) in some recent studies. Internal reliability of the PERMA-Profiler was measured using Cronbach's alpha. Across all 11 samples used to develop and test the PERMA-Profiler (N = 39,153), an acceptable Cronbach's alpha score of .70 or higher was evident for virtually all the PERMA factors. Positive emotions (α = .81 to α = .89), engagement (α = .60 to α = .81), relationships (α = .75 to α = .85), meaning, (α = .82 to α = .95), accomplishment (α = .70 to α = .86). Additionally, acceptable Cronbach's alpha scores were recorded for the overall flourishing score (the average of the PERMA factors) (α = .92 to α = .95), negative emotion (α = .70 to α = .77), and physical health (α = .85 to α = .94). Test-retest reliability was assessed by examining correlations across four samples and three time intervals for the five PERMA domains, overall flourishing, negative emotion, and physical health. All correlations were positive and ranged from r = .53 to r = .90. Consequently, there was evidence that the PERMA-Profiler demonstrated reasonable internal and test-retest reliability.

Internal reliability of the Workplace PERMA Profiler (Kern, 2014) was provided in several studies conducted in a translated version of the instrument. In a study of German-speaking working adults, a German version of the Workplace PERMA Profiler demonstrated

Cronbach values ranging from α = .58 (accomplishment) to α = .91 (physical health), and α = .91 for the overall flourishing score (Harzer et al., 2017). In a Japanese version of the questionnaire distributed to Japanese workers, Cronbach values ranged from α = .75 (relationships) to α = .93 (physical health), and α = .96 for the overall flourishing score (Watanabe et al., 2018). Finally, in a Korean version of the instrument administered to Korean workers, Cronbach values ranged from α = .70 (accomplishment) to α = .94 (physical health), and α = .95 for the overall flourishing score (Choi et al., 2019). Therefore, no reliability data was available for the English-language version of the Workplace PERMA Profiler. However, there was evidence of good internal reliability for the instrument when translated to other languages and for the original PERMA-Profiler (Butler & Kern, 2016).

Questions to Address Careless or Insufficient Effort

This study used self-reported data collected online and asked participants to engage in a self-directed intervention activity. Therefore, inattentive or careless responses were possible (Meade & Craig, 2012), which could have adversely impacted the study findings (Huang et al., 2015). Consequently, a series of questions were embedded in the questionnaires administered at each data collection point to mitigate this possibility. These included bogus items, attention check items, and instructional manipulation checks, as recommended by Curran (2016). Bogus items are unusual questions placed in a scale to garner a specific response. Attention check items are questions placed in a scale that require a defined correct response. Instructional manipulation checks are questions that direct participants to answer in a particular way. Thus, questions to reduce inattentive or careless responding were included in the data collection instruments.

In the Strengths Use Scale (Govindji & Linley, 2007), a bogus item was placed at the end of the 14-item scale (T1: *I have never used an electronic device*; T2: *I have never been*

employed; T3: *I have never eaten food*). The acceptable response to each was to select *I disagree* on the scale. The Workplace PERMA Profiler (Kern, 2014) was a longer scale (23 items). Consequently, an attention check question was embedded approximately halfway through the scale (T1: *Please answer "Never" to this question*; T2: *Please answer "Completely" to this question*; T3: *Please select "5" as your response to this question*). A manipulation check question was placed between the IRB Work Performance Scale (Williams & Anderson, 1991) and the Workplace PERMA Profiler. It provided a list of eight emotions and an *other* option. Respondents were instructed: *To demonstrate you have read the instructions, please ignore all the items listed below. Instead, select the box marked "other." Then click "next" to continue*. The question used to ask about the emotions was modified at each data collection point (T1: *Which of these feelings do you experience regularly at work?*; T2: *Which of these feelings do you experience the most during a typical week?*; T3: *Which of these feelings do you experience regularly at home?*). Finally, no items were placed in the IRB Work Performance Scale because this scale included reverse-coded items that served to identify inattentive or careless respondents. These items are discussed in detail in the Data Analysis section above.

Finally, some closed-ended and open-ended attention check questions were used when administering the intervention instructions to help ensure respondents were attentive. First, after respondents in the three strengths intervention groups had watched a 15-minute video about character strengths, they were provided with two statements and asked to indicate if they were true or false (*Character strengths are associated with weight loss*; *Character strengths are associated with greater happiness*). Additionally, after receiving the instructions for each week's activity, all respondents were asked to describe it (*In one or two sentences, please describe the activity you should work on this week. Please be as specific as possible in your response and*

include all relevant details). Thus, various questions were used during data collection and during the intervention to minimize careless or inattentive responses.

Ethical Considerations

The current study complied with the Belmont Principles (U.S. Department of Health, Education, and Welfare, 1979) and the ethical standards of the APA (2017). Additionally, it was reviewed and approved by the Capella University Institutional Review Board. This section describes the various ethical challenges presented by the study and how each was addressed for sampling and recruitment, data collection and analysis, and risk assessment.

Sampling and Recruitment

As noted in the participant protection discussion, and as with any study, some of the ethical challenges in the research design and sampling plan included voluntary participation, informed consent, anonymity, and participants' confidentiality (Dattalo, 2010). Voluntary participation was addressed by the convenience sampling design. Informed consent was secured by screening questions evaluating eligibility (i.e., ages 18-65, employees who work full-time, daily access to high-speed Internet) and an informed consent form approved by the Capella University Institutional Review Board. Once volunteers had granted their explicit consent to participate, their anonymity and confidentiality were secured in two ways. First, no personally identifying data were collected from participants (e.g., name, email). Instead, their MTurk (Amazon Mechanical Turk, 2018) worker IDs were used as an identifying code to communicate with participants during the study and match the various data sets after data collection. Second, once the data were collected and matched, the MTurk worker IDs were removed from the primary data file and stored in a separate location on a secure computer and hard drive. Participants were made aware of this process in the informed consent form. Thus, various

measures were used during the sampling and recruitment process to address the potential ethical challenges of informed consent, anonymity, and confidentiality and ensure compliance with the APA (2017) standards and Belmont Principles (U.S. Department of Health, Education, and Welfare, 1979).

An additional ethical challenge was the principle of justice (APA, 2017; U.S. Department of Health, Education, and Welfare, 1979), which requires that participants be treated equally and not subject to discrimination. Technically, the use of nonprobability sampling restricted which individuals could participate in this study. Namely, only MTurk (Amazon Mechanical Turk, 2018) workers located in the United States, employed full-time, ages 18-65, with a minimum 95% HIT approval rating, and having completed at least 5,000 HITs had the opportunity to participate. However, the MTurk website is freely accessible to anyone age 18+ in the U.S., and it was not feasible to offer the study to all full-time American employees, ages 18-65. Additionally, the opportunity to participate in the study was available without discrimination to all MTurk workers who met the inclusion criteria. Thus, the recruitment strategy met the principle of justice as far as possible, though not completely.

Data Collection and Analysis

Data collection and analysis presented ethical challenges related to privacy and confidentiality, as detailed in the APA (2017) standards. Data were collected online using questionnaires hosted by Promark Research Corporation (n.d.-a). This platform has multiple security measures to ensure the protection and confidentiality of the data gathered on it, including security at its data centers, encryption of data, and prevention and monitoring of security breaches (Promark Research Corporation, n.d.-b). Once all data had been collected, it was downloaded and stored on the researcher's personal computer and a separate hard drive (for

backup purposes), both of which were password-protected. The Microsoft Excel (Microsoft, 2021) and IBM SPSS (IBM, n.d.) files of data were also password-protected. When shared with any third party for verification of statistical analysis, data were sent via Capella University's secure email system. Any third party reviewing the Microsoft Excel or IBM SPSS file was required to sign a confidentiality agreement, save the data file to a computer that was also password-protected, and permanently delete the file after completing their consultation. Thus, participant confidentiality and data security were ensured throughout data collection and analysis, in compliance with ethical standards (APA, 2017). Additionally, data were secured for 7 years and destroyed by the best commercial means available after that time.

Risk Assessment

Per the Belmont Principles (U.S. Department of Health, Education, and Welfare, 1979) and APA (2017) guidelines, the research topic was classified as minimal risk. The target population was employees who may be considered a vulnerable population, particularly if coerced into answering questions on sensitive topics such as work performance (U.S. Department of Health, Education, and Welfare, 1979). However, the study was not conducted at a specific workplace. Instead, it used online recruiting with informed consent so participants could remain anonymous and have the right to withdraw at any time, thereby mitigating these concerns. A risk assessment suggested that no physical, legal, or social harm was expected. Though there may have been some inconvenience (e.g., completing questionnaires and participating in the intervention), or possible economic harm (e.g., implementing intervention activities required some time during work hours), and psychological harm (e.g., participants were asked to use specific character strengths more or in new ways). Indeed, overusing or emphasizing specific strengths can be detrimental for individuals and others (Grant & Schwartz,

2011; Gruman et al., 2018; Kaiser & Overfield, 2011; Niemiec, 2019). However, participants chose the strengths they used within their randomly assigned intervention group (i.e., top strengths, bottom strengths, or combination of both) and were encouraged to use a specific strength for only 1 week at a time. Thus, given the intervention's brevity and participant autonomy in selecting strengths, the potential for psychological or economic harm was minimal. For these reasons, the study did not seem to present any more threat than would be present in daily life and, therefore, was considered minimal risk.

Summary

This chapter examined the methods and procedures used in this study. The purpose of the study was to explore the impact of different character strengths interventions on the dependent variables of strengths use, job performance, and flourishing at work. The investigation was a quantitative, experimental, longitudinal research design. Sampling, recruitment, data collection, data analysis, intervention procedures, and ethical considerations were discussed. The study was approved by the Capella University Institutional Review Board and was considered minimal risk. The results of the study are discussed in Chapter 4.

CHAPTER 4. RESULTS

The present study was conducted to examine the effectiveness of strengths interventions on work-related dependent variables. Specifically, the study sought to address whether character strengths interventions significantly impacted levels of strengths use, job performance, and flourishing at work among full-time employees. This chapter provides background on the quantitative investigation and a description of the sample. Additionally, hypothesis testing and post hoc analysis conducted in IBM SPSS v.26.0 (IBM, n.d.) are reviewed. The chapter concludes with a summary of the research findings.

Description of the Sample

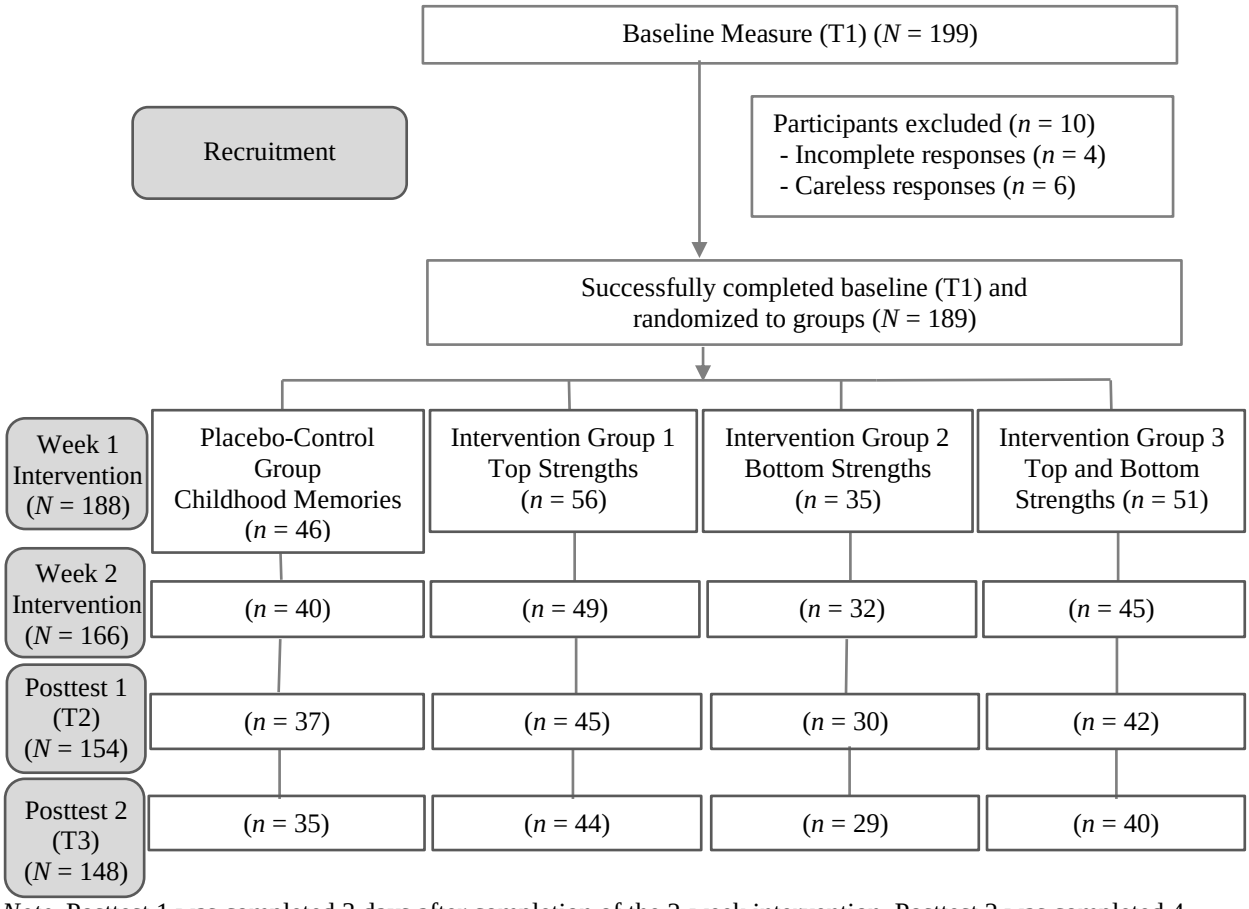
The study included $N = 148$ participants who were recruited from MTurk (Amazon Mechanical Turk, 2018), and qualified as full-time employees, ages 18-65, located in the United States. Using G*Power (Faul et al., 2007), assuming a medium effect size of .25, an alpha level of .05, and the use of a two-way mixed ANOVA for each dependent variable, the power for this sample was calculated at .88. Initially, $N = 199$ volunteers qualified for and consented to participate in the study and responded to the baseline questionnaire. However, $n = 10$ participants were excluded from the study for incomplete or careless responses. Thus, $N = 189$ participants were retained at the baseline measurement, but only $N = 148$ participants completed all questionnaires at all time points.

There were three points of measurement and four points at which respondents had to log on to participate. The first measurement (T1) was the baseline survey, administered prior to the intervention. The second measurement (T2, first posttest) was originally scheduled for the end of Week 2, upon completion of the 2-week intervention. However, due to a technical glitch with MTurk (Amazon Mechnical Turk, 2018), this data collection point was delayed 3 days. The third

measurement (T3, second posttest) occurred, as planned, 4 weeks after completion of the intervention. The fourth point at which respondents had to participate was at the end of Week 1, which was the midpoint of the intervention. They were required to log on to receive the intervention instructions for Week 2 of the intervention. The overall retention rate from the baseline (N = 189) to final point of measurement (N = 148) was 78%. Figure 1 displays the flowchart of participants and sample sizes for all groups at each point during the study.

Figure 1

Flowchart of Participants



Note. Posttest 1 was completed 3 days after completion of the 2-week intervention. Posttest 2 was completed 4 weeks after the 2-week intervention.

Demographic data collected during the baseline questionnaire included gender, age, state of residence, and occupation. There were n = 73 men (49.3%) and n = 75 women (50.7%), and

the mean age was 41.2 years. Almost half of participants (n = 71 or 48.0%) were professionals (e.g., analyst, accountant, teacher, etc.), just over one-fifth (n = 31 or 20.9%) were managers, 16.9% held clerical positions (e.g., secretary, administrator, etc.), 9.5% had sales jobs, 4.1% were blue collar (e.g., courier, production operator, etc.), and one respondent (0.7%) failed to identify their occupation. Additionally, n = 39 (26.4%) resided in the Northeastern region of the United States, n = 35 (23.6%) in the Midwestern region, n = 47 (31.8%) in the Southern region, and n = 27 (18.2%) in the Western region. Table 7 provides the demographic data for each of the four groups in the sample.

Table 7

Frequency Counts for Demographic Data by Group

	Demographic	Placebo Control	Group 1 Top Strengths	Group 2 Bottom Strengths	Group 3 Top and Bottom Strengths
Gender	Male	17	22	11	23
	Female	18	22	18	17
Age	Median Age	42.4	41.8	40.0	36.9
Occupation	Professional	15	21	15	20
	Manager	8	13	5	5
	Clerical	7	6	5	7
	Sales	3	2	2	7
	Blue Collar	1	2	2	1
	Unknown	1	0	0	0
U.S. Region	Northeast	5	16	6	12
	Midwest	10	6	9	10
	South	11	13	8	15
	West	9	9	6	3

Note: Median age is displayed instead of frequency counts for all ages. U.S. regions are defined as follows. Northeast: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia. Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota. South: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming.

A series of chi square tests and a one-way analysis of variance (ANOVA) indicated that the four groups did not differ significantly on each of the demographic variables: gender [$\chi 2(3) = 2.59$, $p = .459$], age [$F(3, 144) = .384$, $p = .765$], occupation [$\chi 2(15) = 12.25$, $p = .660$], and U.S. region [$\chi 2(9) = 11.54$, $p = .240$]. Finally, a series of chi square tests and an independent *t* test were performed to compare the demographic variables of participants who completed the 6-week study ($N = 148$) versus those who dropped out at some point ($n = 41$). No significant difference was found for any of the variables: gender [$\chi 2(1) = .795$, $p = .372$], age [$F(84.32) = -1.24$, $p = .219$], occupation [$\chi 2(5) = 8.25$, $p = .143$], and U.S. region [$\chi 2(3) = 7.02$, $p = .071$].

Hypothesis Testing

A series of two-way mixed ANOVAs were used to answer the research questions. There are nine assumptions that must be met for a two-way mixed ANOVA. The first three are related to the study design, and the remaining six can be statistically tested. The assumptions related to study design include (a) there is one dependent variable, measured as continuous data, (b) there is one categorical between-subjects factor that consists of two or more categorical, independent groups, and (c) there is one categorical within-subjects factor that consists of two or more categorical, independent groups (Verma, 2016). Each of these assumptions were met in the study design. Although there were three dependent variables (i.e., strengths use, performance, and flourishing at work), a two-way mixed ANOVA was conducted for each separately. The between-subjects independent variable was the groups, with four levels. The within-subjects independent variable was time, with three levels: baseline, first posttest, and second posttest. Finally, participants completed the study independent of one another. Therefore, the study design assumptions were all met.

The remaining six assumptions that can be statistically tested include (d) there are no outliers, (e) the dependent variable demonstrates normality, (f) there is an adequate sample size, (g) there is homogeneity of variances, (h) there is homogeneity of variance-covariance matrices, and (i) there is no sphericity (Laerd Statistics, n.d.-c; Verma, 2016). Each of these assumptions was examined for each dependent variable.

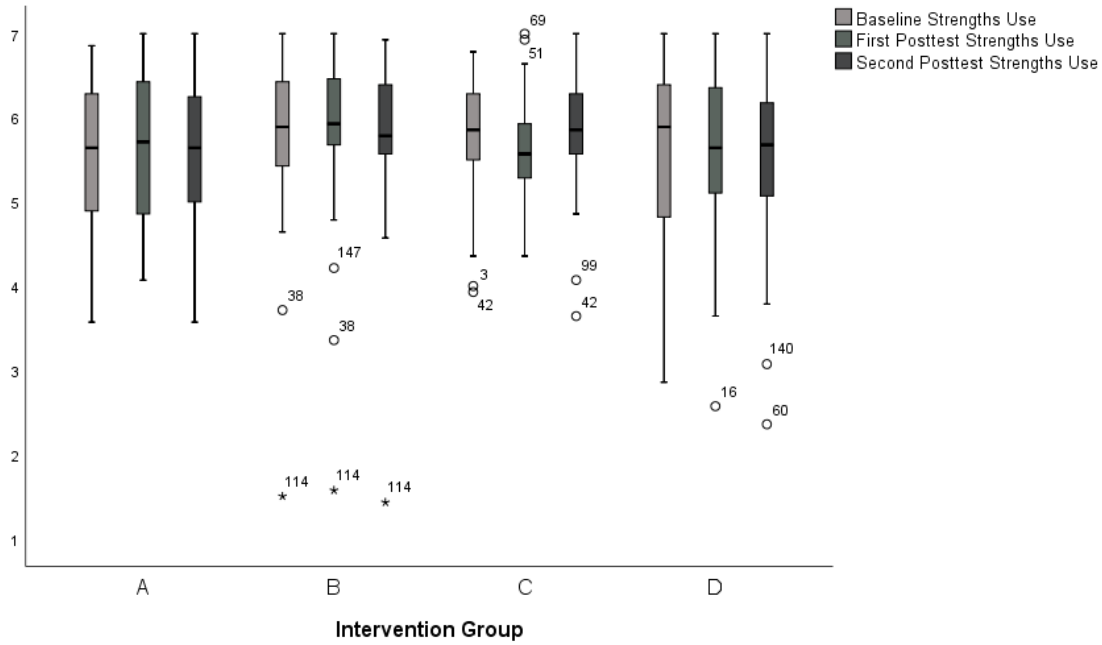
Assumption of No Outliers

For a two-way mixed ANOVA, there is an assumption that there are no outliers in any cell of the study design (Laerd Statistics, n.d.-c). Therefore, a series of boxplots was examined to evaluate if outliers existed in each dependent variable at each measurement point. Each of the boxplots displays a dependent variable by time and group, where Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group. The shaded box for each group represents the middle 50% of the total score spread. The top and bottom edges of each box represent the 25^{th} and 75^{th} percentiles, respectively, and the horizontal lines that are beyond either side of the box represent the possible outlier scores (Warner, 2013).

Figure 2 shows the boxplots for the dependent variable, strengths use, across the three timepoints of measurement. There were no outliers in Group A, but some in other groups. Group B had three outliers (cases 38, 114, and 147), one of which was an extreme outlier (case 114), as indicated by the asterisk. Group C appeared to have five outliers (cases 3, 42, 51, 69, and 99), and Group D had three outliers (cases 16, 60, and 140).

Figure 2

Boxplot for Strengths Use by Group

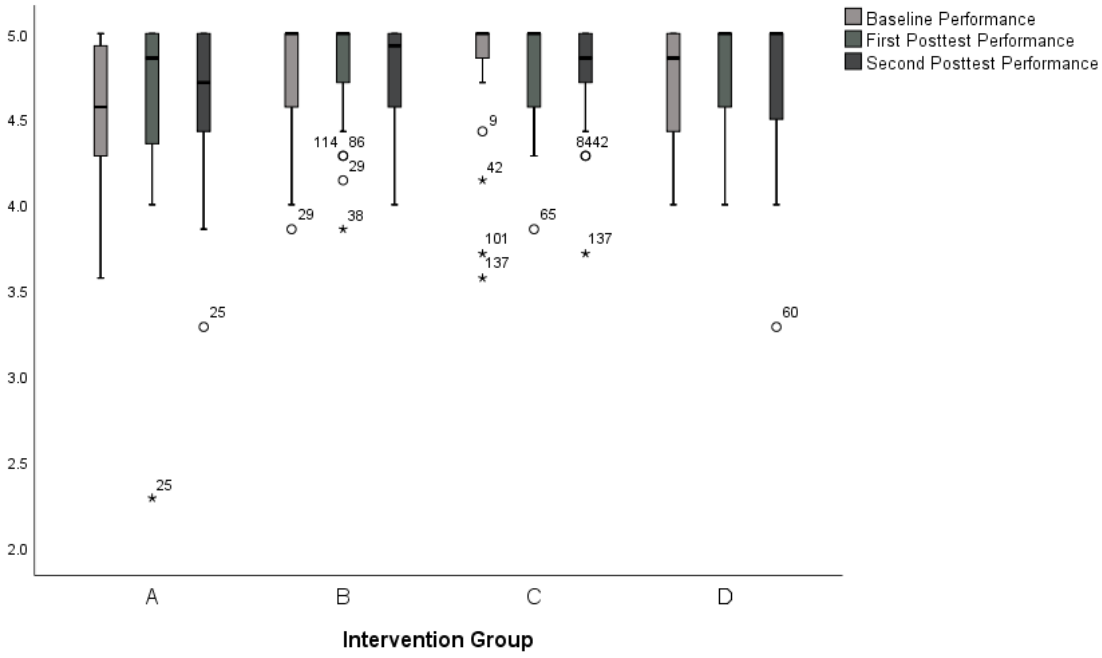


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 3 shows the boxplots for the variable, job performance, by intervention group, across the three points in time. There was just one outlier (case 25) for Group A, which was an extreme outlier at the first posttest, indicated by the asterisk. There were four outliers for Group B (cases 29, 38, 86, and 114), one of which was an extreme outlier (case 38). There were also six outliers in Group C (cases 9, 42, 65, 84, 101, and 137), three of which were extreme outliers (cases 42, 101, and 137). There was just one outlier for Group D (case 60).

Figure 3

Boxplot for Job Performance by Group

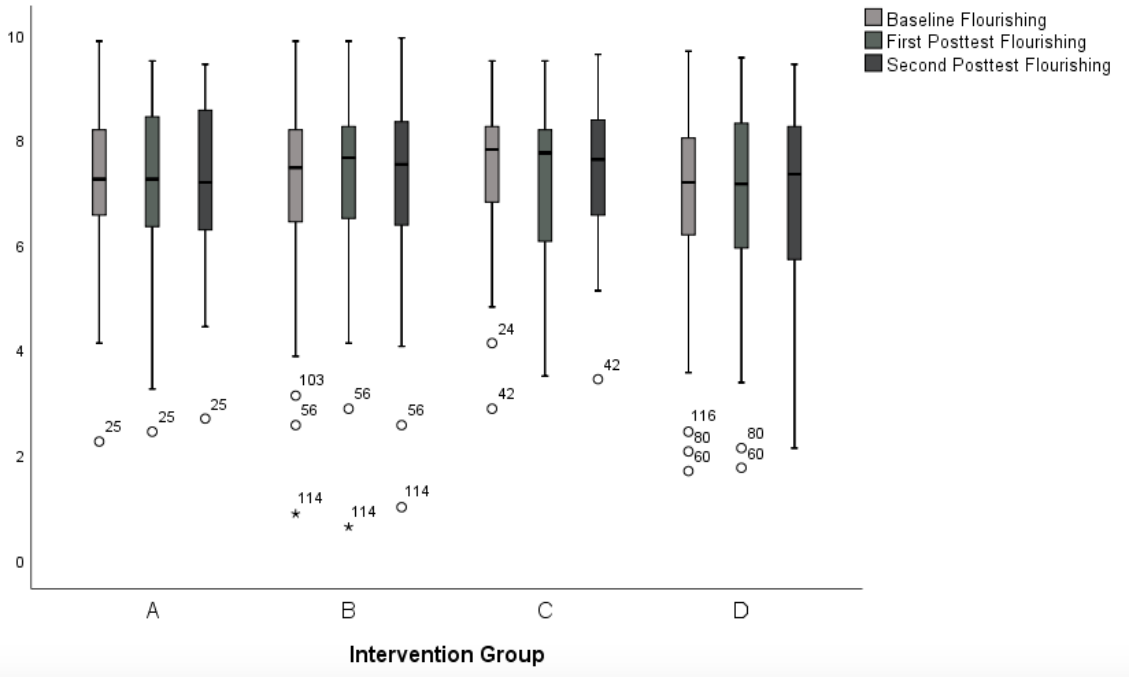


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 4 displays the boxplots for the dependent variable, flourishing at work, by intervention group across the three periods of measurement. There was one outlier (case 25) for Group A. Group B had three outliers (cases 56, 103, and 114), one of which was an extreme outlier (case 114). Group C appeared to have two outliers (cases 24 and 42), and Group D had three outliers (cases 60, 80, and 116).

Figure 4

Boxplot for Flourishing at Work by Group



Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Thus, the boxplots indicated there were several outliers across various cells in the data. However, boxplots generated by IBM SPSS (n.d.) might only be indications of outliers (Verma, 2016). Therefore, an additional method was used to evaluate outliers. Standardized *z* scores were generated in IBM SPSS for each of the variables by intervention group to identify participants with values outside ±3 standard deviations from the mean. Eight outliers were identified using this method, including cases 16 and 114 for strengths use, cases 25, 36, 60, 65, and 137 for job performance, and cases 42 and 114 for flourishing at work. Each of these outliers also appeared in some of the boxplots, thereby providing further confirmation of their likely outlier status.

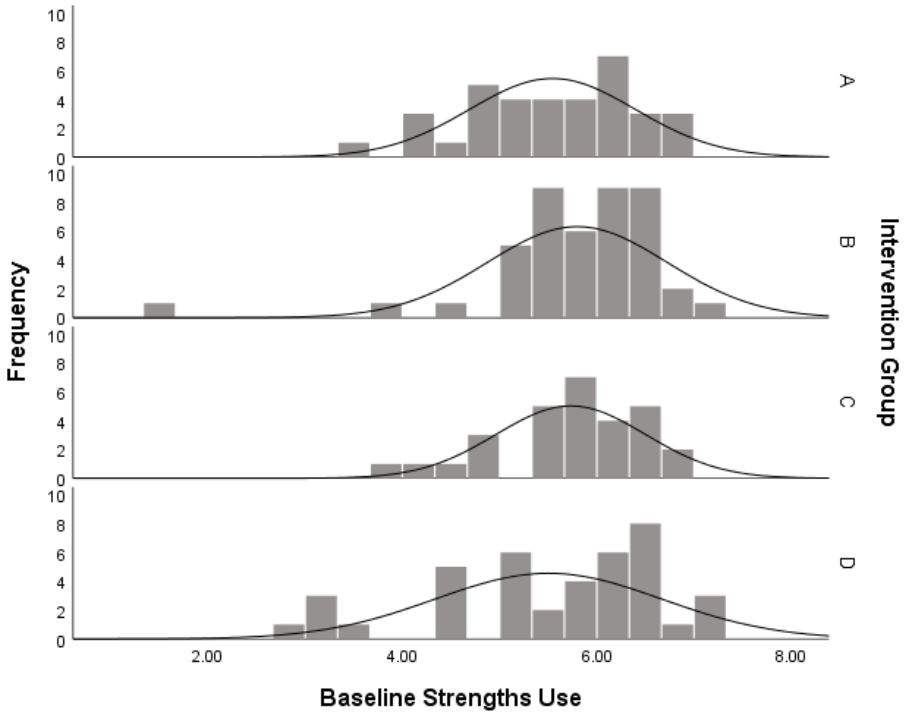
Assumption of Normality

An assumption of the two-way mixed ANOVA is that there is normality for the dependent variable in each cell of the study (Verma, 2016). Normal distribution was assessed by reviewing histograms, skewness and kurtosis scores, and conducting the Shapiro-Wilk test of normality. First, a series of histograms were examined. Each of the histograms displays a dependent variable by group, where Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group. The line on each histogram represents normal distribution.

Figure 5 displays the histograms for baseline strengths use by intervention group. A visual inspection suggested that the frequency distribution of each group was negatively skewed, with more data present in the left-hand tails of the curves than in the right-hand tails. As such, the distribution curves were not perfectly symmetrical, and the graphs showed that there were some outliers. The kurtosis for Groups A and D appeared to be slightly platykurtic (i.e., flatter-than-normal peak). By contrast, the kurtosis for Groups B and C seemed to be leptokurtic (i.e., sharper-than-normal peak).

Figure 5

Histograms for Baseline Strengths Use by Group

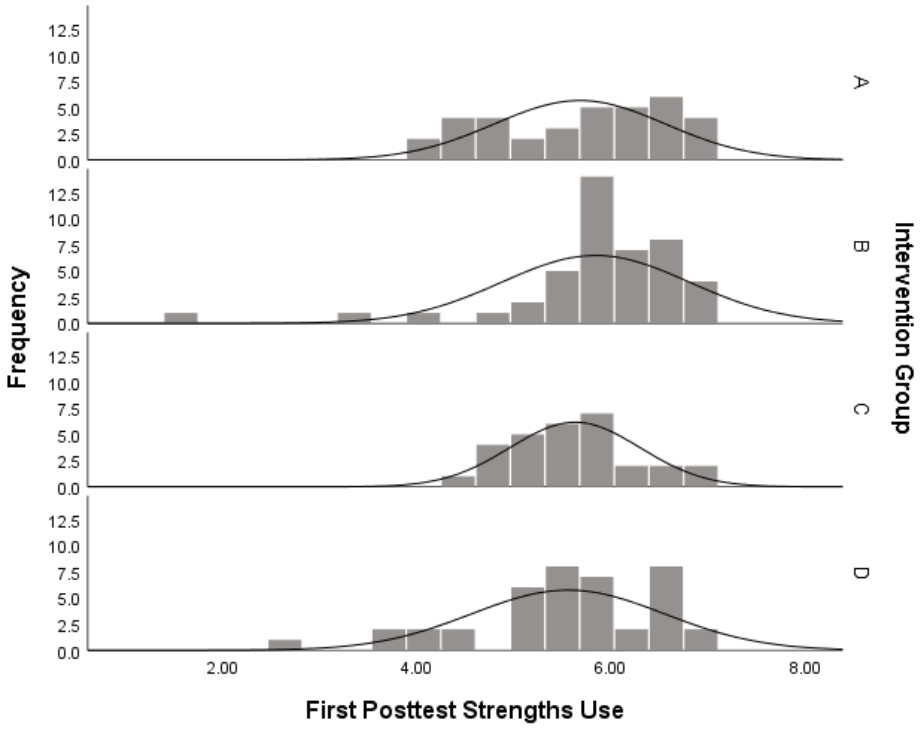


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 6 shows the histograms for first posttest strengths use by intervention group. The charts indicated that the frequency distributions for all but Group C were negatively skewed, with more data present in the left-hand tails of the curves than in the right-hand tails. Group C appeared to be modestly positively skewed, with more data shown in the right-hand tails than the in the left-hand tails. As such, the distribution curves were not perfectly symmetrical, and the graphs showed that there were some outliers. The kurtosis for Groups A and C appeared to be slightly platykurtic. By contrast, the kurtosis for Group B seemed leptokurtic, and Group D appeared to be approaching mesokurtic (i.e., normal).

Figure 6

Histograms for First Posttest Strengths Use by Group

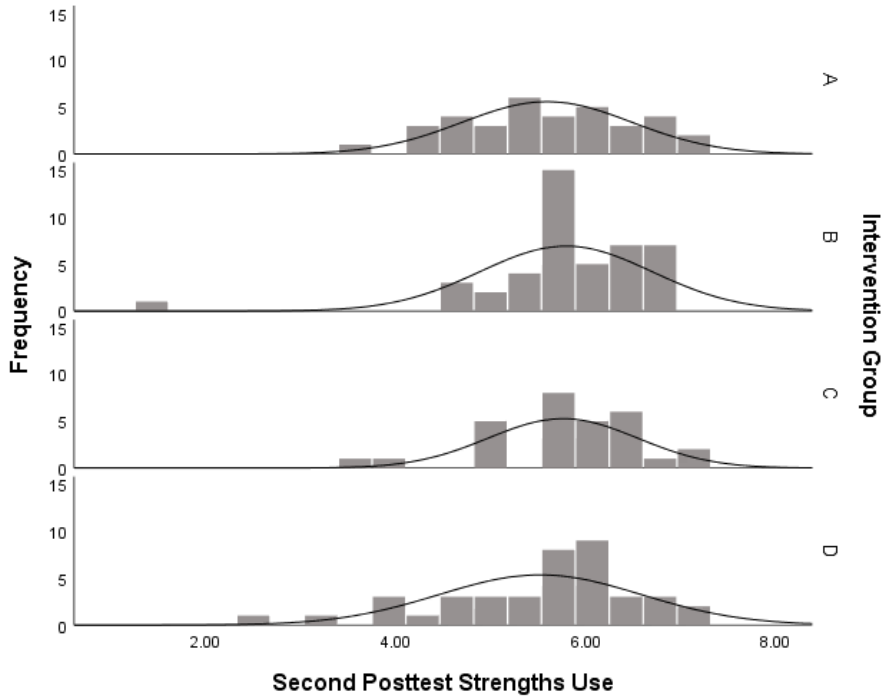


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 7 displays the histograms for second posttest strengths use by intervention group. The graphs suggested that the frequency distributions for all groups were negatively skewed. Consequently, the distribution curves were not symmetrical, and the charts showed that there were some outliers. The kurtosis for Group A seemed to be slightly platykurtic. The kurtosis for Group B seemed to be leptokurtic. Groups C and D appeared to be approaching mesokurtic.

Figure 7

Histograms for Second Posttest Strengths Use by Group

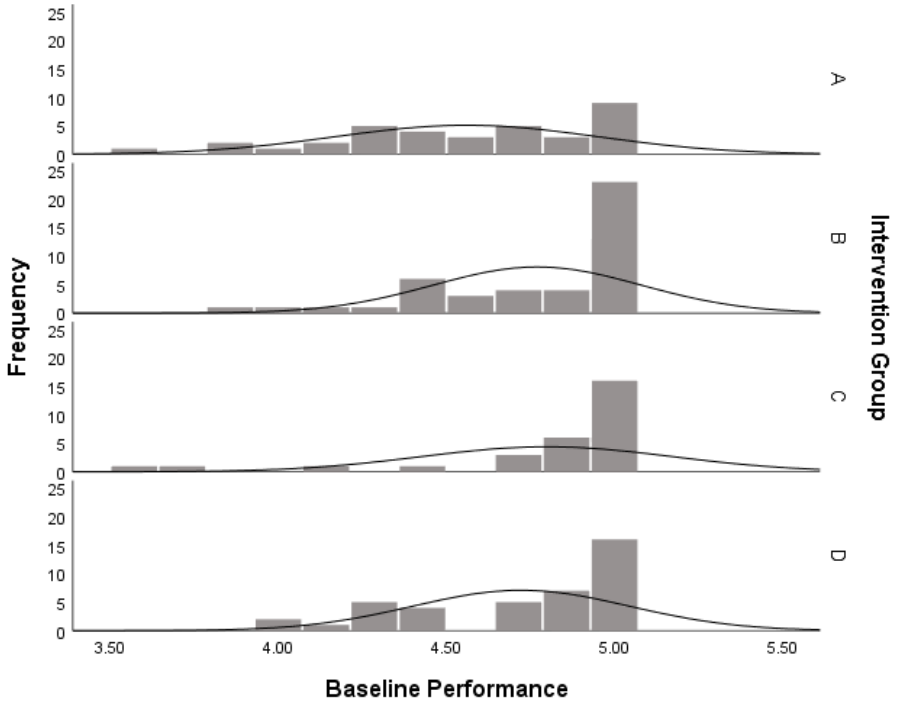


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 8 shows the histograms for baseline job performance by intervention group. The histograms indicated that the frequency distributions for all groups were negatively skewed. Therefore, the distribution curves were not symmetrical, and the charts showed some outliers. The kurtosis for Groups A and D seemed to be platykurtic or approaching mesokurtic. The kurtosis for Groups B and C appeared to be leptokurtic.

Figure 8

Histograms for Baseline Job Performance by Group

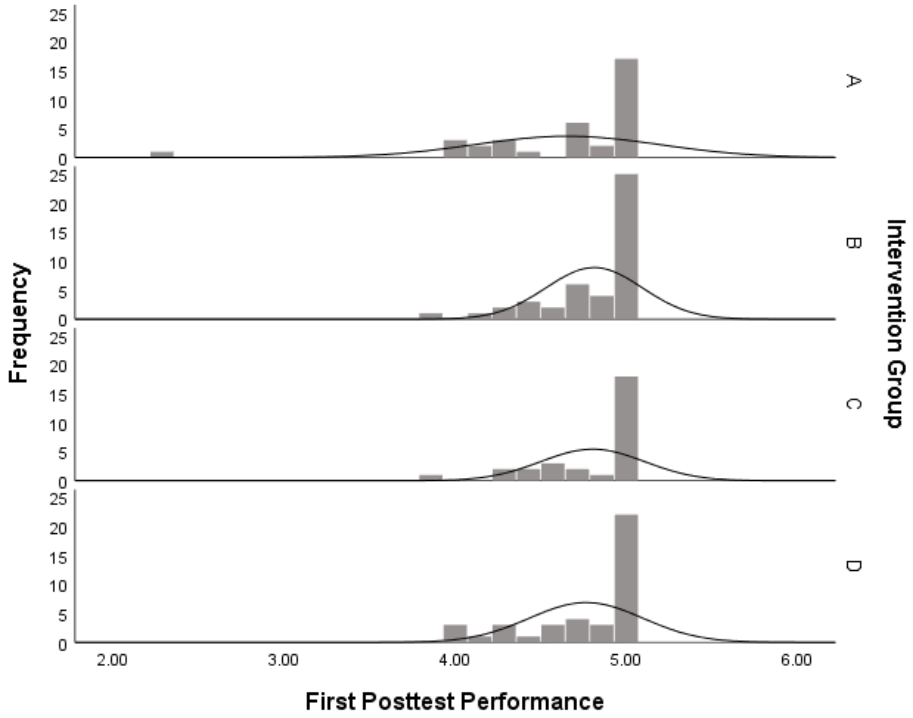


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 9 shows the histograms for first posttest job performance by intervention group. The graphs suggested that the frequency distributions for all groups were negatively skewed. As such, the distribution curves were not symmetrical, and the charts indicated some outliers. The kurtosis for all groups appeared to be leptokurtic, with an influential mode of 5.0.

Figure 9

Histograms for First Posttest Job Performance by Group

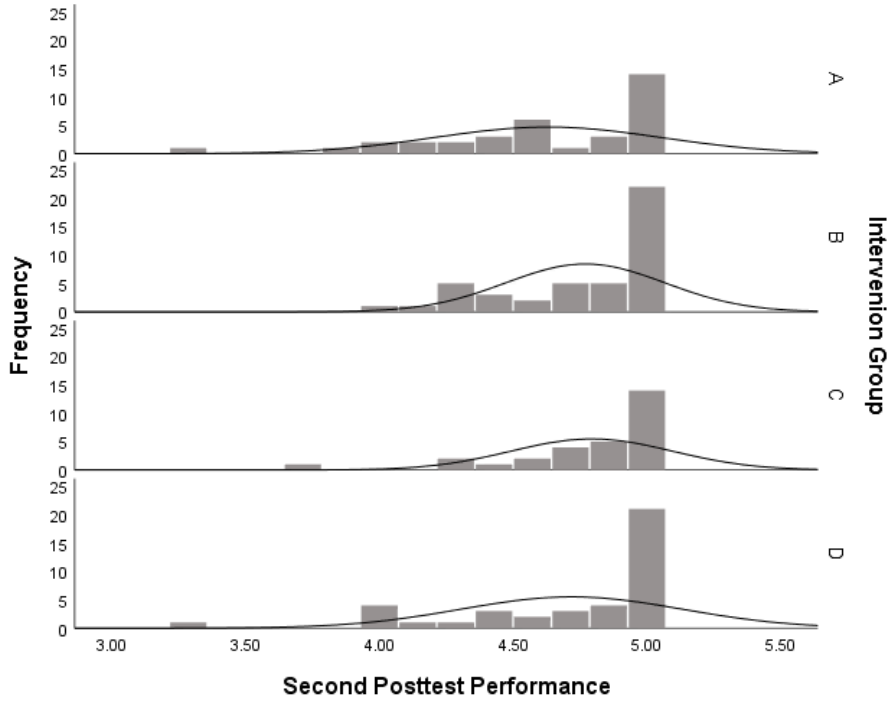


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 10 shows the histograms for second posttest job performance by intervention group. The charts indicated that the frequency distributions for all groups were negatively skewed. Therefore, the distribution curves were not symmetrical, and the graphs suggested there were some outliers. The kurtosis for all groups seemed to be leptokurtic, again with an influential mode of 5.0.

Figure 10

Histograms for Second Posttest Job Performance by Group

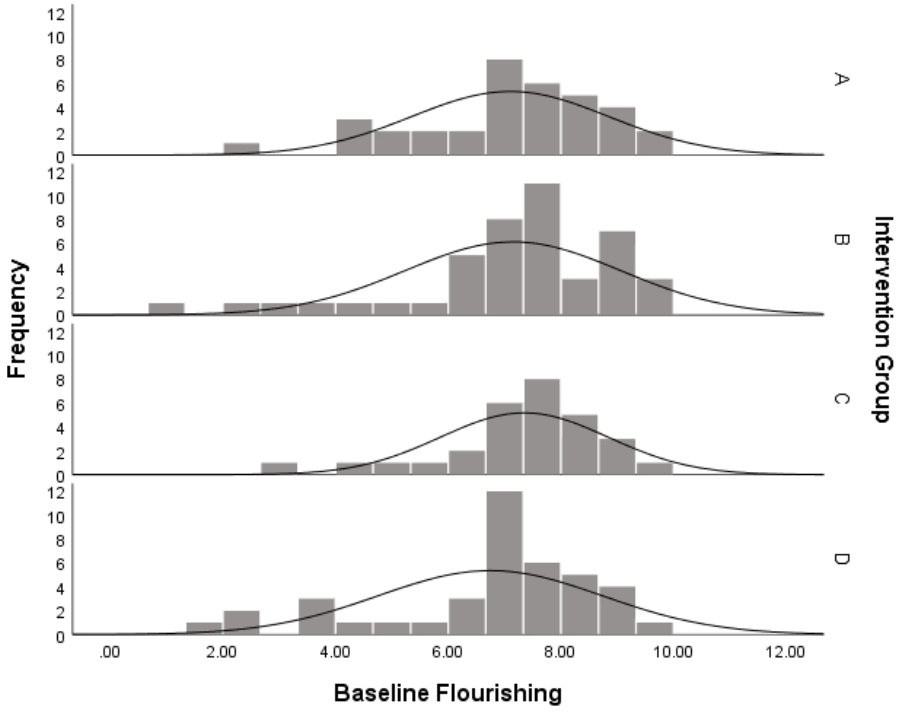


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 11 shows the histograms for baseline flourishing at work by intervention group. The charts indicated that the frequency distributions for all groups were negatively skewed. Consequently, the distribution curves were not symmetrical, and the graphs suggested there were some outliers. The kurtosis for Groups B and C seemed to be leptokurtic. The kurtosis for Groups A and D appeared to be either slightly leptokurtic or close to mesokurtic.

Figure 11

Histograms for Baseline Flourishing at Work by Group

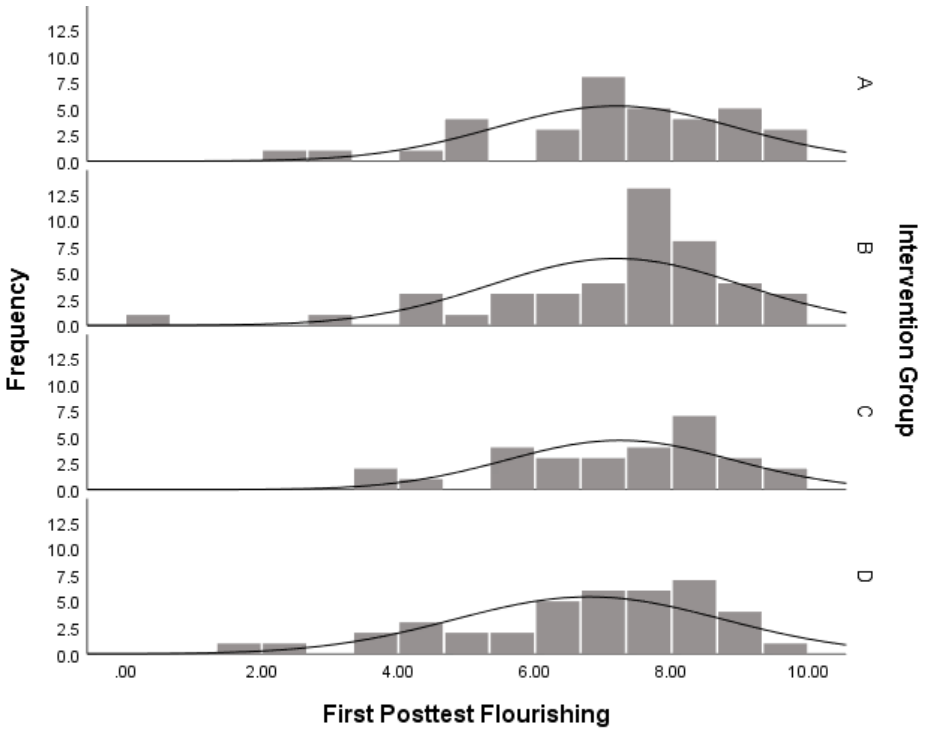


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 12 shows the histograms for first posttest flourishing at work by intervention group. The charts suggested that the frequency distributions for all groups were negatively skewed. Therefore, the distribution curves were not symmetrical, and the graphs indicated there were some outliers. The kurtosis for Group C seemed to be sightly platykurtic. Groups A and D appeared to be either slightly leptokurtic or close to mesokurtic. The kurtosis for Group B seemed to be leptokurtic.

Figure 12

Histograms for First Posttest Flourishing at Work by Group

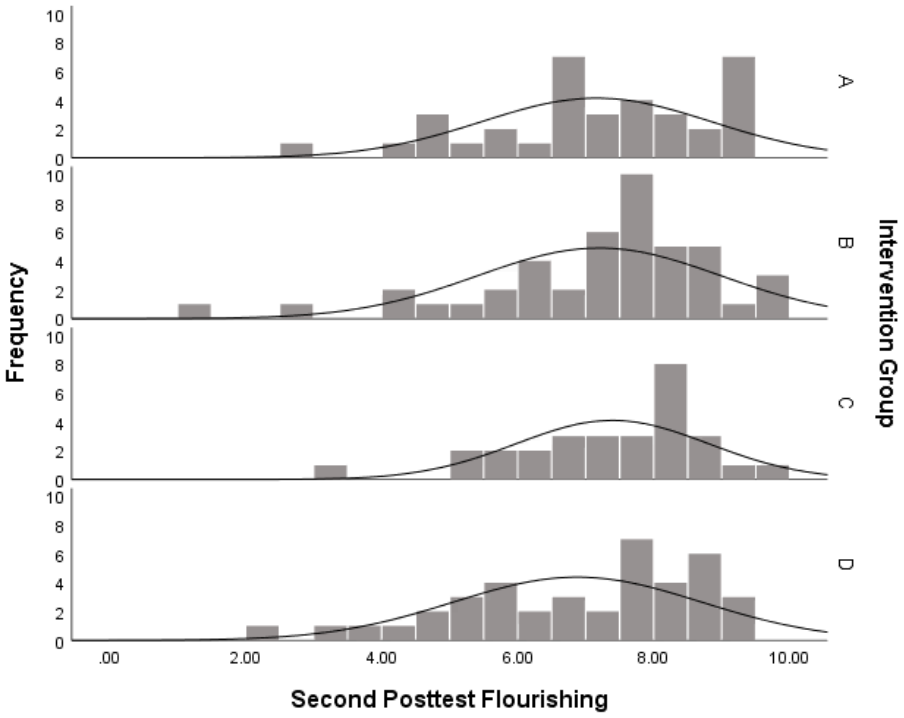


Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Figure 13 shows the histograms for second posttest flourishing at work by intervention group. The charts indicated that the frequency distributions for all groups were negatively skewed. Consequently, the distribution curves were not perfectly symmetrical, and the graphs suggested there were some outliers. The kurtosis for Group B seemed to be leptokurtic. Groups A, C, and D appeared to be close to mesokurtic, though Group C could have been slightly leptokurtic.

Figure 13

Histograms for Second Posttest Flourishing at Work by Group



Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

To further evaluate normality, descriptive statistics were examined and are displayed in Table 8 for all the dependent variables. The mean scores for strengths use ranged from $M = 5.50$ with a standard deviation of 1.17 for the baseline measure in Group D to $M = 5.84$ with a standard deviation of .97 for the first posttest measure in Group B. The mean scores for job performance ranged from $M = 4.56$ with a standard deviation of .39 for the baseline measure in Group A to $M = 4.81$ with a standard deviation of .28 for the first posttest measure in Group B. The mean scores for flourishing at work ranged from $M = 6.75$ with a standard deviation of 1.99 for the baseline measure in Group D to $M = 7.39$ with a standard deviation of 1.41 for the second posttest measure in Group C.

Skewness and kurtosis scores between ±1 indicate "excellent" normal distribution, and scores between ±2 indicate "acceptable" normal distribution (George & Mallery, 2016). Most skewness scores were within the acceptable range of ±2. However, some exceeded the acceptable range, including Group B for all strengths use measures (-2.53, -2.46, and -2.60 respectively), Group C for baseline performance (-2.41) and second posttest performance (-2.04), and Group A for first posttest performance (-2.69). Kurtosis scores beyond the acceptable range were more numerous and included Group B for all strengths use measures (10.23, 8.61, and 11.63 respectively), Group C for baseline performance (5.31), Group A (9.82) and Group B (2.22) for first posttest performance, Groups C (4.82) and D (2.45) for second posttest performance, Group B for all measures of flourishing (2.17, 2.87, and 2.83 respectively), and Group C (2.12) for baseline flourishing. Therefore, based only on these descriptive statistics, it appeared that several cells for each dependent variable were not normally distributed.

Table 8

Descriptive Statistics for Dependent Variables by Group

					Skewness		Kurtosis	
Variable	Group	N	Mean	Std. Deviation	Statistic	Std. Error	Statistic	Std. Error
Baseline Strengths Use	A	35	5.5429	.85402	-.405	.398	-.620	.778
	B	44	5.7987	.92688	-2.529	.357	10.226	.702
	C	29	5.7315	.76852	-.894	.434	.336	.845
	D	40	5.5018	1.16838	-.883	.374	-.030	.733
First Posttest Strengths Use	A	35	5.6796	.88001	-.284	.398	-1.166	.778
	B	44	5.8425	.96750	-2.457	.357	8.611	.702
	C	29	5.6305	.67089	.259	.434	-.315	.845
	D	40	5.5589	.99263	-.949	.374	.923	.733
Second Posttest Strengths Use	A	35	5.5939	.89496	-.200	.398	-.740	.778
	B	44	5.7938	.90773	-2.604	.357	11.633	.702
	C	29	5.7611	.78671	-.859	.434	.954	.845
	D	40	5.5214	1.06772	-1.032	.374	1.069	.733
Baseline Performance	A	35	4.5592	.39103	-.635	.398	-.295	.778
	B	44	4.7695	.30996	-1.269	.357	.844	.702
	C	29	4.7980	.37509	-2.412	.434	5.309	.845
	D	40	4.7214	.3218	-.887	.374	-.562	.733
First Posttest Performance	A	35	4.6531	.54264	-2.694	.398	9.828	.778
	B	44	4.8117	.28199	-1.624	.357	2.220	.702
	C	29	4.8030	.30404	-1.540	.434	1.925	.845
	D	40	4.7643	.33236	-1.233	.374	.223	.733
Second Posttest Performance	A	35	4.6286	.42463	-1.205	.398	1.397	.778
	B	44	4.7695	.29746	-1.046	.357	-.200	.702
	C	29	4.7931	.30205	-2.038	.434	4.815	.845
	D	40	4.7179	.41364	-1.634	.374	2.445	.733
Baseline Flourishing	A	35	7.0982	1.74667	-.731	.398	.414	.778
	B	44	7.1477	1.91442	-1.311	.357	2.166	.702
	C	29	7.3491	1.49016	-1.34	.434	2.121	.845
	D	40	6.7453	1.99003	-1.056	.374	.603	.733
First Posttest Flourishing	A	35	7.1821	1.77596	-.832	.398	.372	.778
	B	44	7.1903	1.84205	-1.453	.357	2.872	.702
	C	29	7.2392	1.64862	-.737	.434	-.183	.845
	D	40	6.7859	1.96417	-.914	.374	.177	.733
Second Posttest Flourishing	A	35	7.1571	1.68936	-.602	.398	-.051	.778
	B	44	7.1989	1.79425	-1.446	.357	2.829	.702
	C	29	7.3922	1.41312	-.889	.434	.689	.845
	D	40	6.8781	1.82250	-.663	.374	-.154	.733

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

As a final assessment of normality, the Shapiro-Wilk test of normality was conducted for each dependent variable by group. The Shapiro-Wilk test is a statistical procedure used to examine whether there is normality for a dependent variable (Warner, 2013). The Shapiro-Wilk test null hypothesis is that there is normal distribution. The alternative hypothesis is that there is not normal distribution. An alpha level of .05 is assumed per standard practice (Warner, 2013). In Table 9, the Shapiro-Wilk test results indicated that for most tests of normality for the dependent variables by group the *p* value was less than the standard alpha level of .05, indicating that these results were statistically significant. Consequently, the null hypothesis was rejected, which inferred that there was not normal distribution for the dependent variables across most or all groups. Indeed, the only cells that indicated normality, with *p* values above .05 were Group A for all levels of strengths use ($p = .292$, .062, and .425 respectively), Group C for the first posttest ($p = .710$) and second posttest ($p = .073$) for strength use, Group A for baseline ($p = .129$) and second posttest ($p = .093$) for flourishing, Group C for the first posttest ($p = .058$) and second posttest ($p = .123$) for flourishing, and group D ($p = .085$) for second posttest for flourishing. Thus, based on a review of histograms, skewness and kurtosis scores, and tests of normality, there appeared to be a lack of normal distribution across several cells of data for each dependent variable.

Table 9

Normality Tests for Dependent Variables by Group

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Variable	Group	Statistic	df	Sig.	Statistic	df	Sig.
Baseline	A	.127	35	.167	.964	35	.292
Strengths Use	B	.173	44	.002	.789	44	.000
	C	.175	29	.024	.918	29	.027
	D	.169	40	.005	.905	40	.003
First Posttest	A	.111	35	.200*	.941	35	.062
Strengths Use	B	.197	44	.000	.782	44	.000
	C	.087	29	.200*	.975	29	.710
	D	.123	40	.132	.931	40	.018
Second Posttest	A	.073	35	.200*	.969	35	.425
Strengths Use	B	.176	44	.002	.787	44	.000
	C	.163	29	.046	.935	29	.073
	D	.167	40	.007	.925	40	.011
Baseline	A	.140	35	.081	.913	35	.009
Performance	B	.294	44	.000	.766	44	.000
	C	.321	29	.000	.598	29	.000
	D	.238	40	.000	.810	40	.000
First Posttest	A	.261	35	.000	.664	35	.000
Performance	B	.316	44	.000	.722	44	.000
	C	.362	29	.000	.706	29	.000
	D	.311	40	.000	.733	40	.000
Second Posttest	A	.209	35	.000	.834	35	.000
Performance	B	.281	44	.000	.744	44	.000
	C	.247	29	.000	.726	29	.000
	D	.277	40	.000	.729	40	.000
Baseline	A	.137	35	.092	.952	35	.129
Flourishing	B	.151	44	.013	.896	44	.001
	C	.160	29	.057	.897	29	.008
	D	.188	40	.001	.900	40	.002
First Posttest	A	.106	35	.200*	.935	35	.040
Flourishing	B	.176	44	.001	.891	44	.001
	C	.144	29	.127	.931	29	.058
	D	.149	40	.025	.920	40	.008
Second Posttest	A	.091	35	.200*	.947	35	.093
Flourishing	B	.142	44	.026	.894	44	.001
	C	.122	29	.200*	.943	29	.123
	D	.134	40	.070	.951	40	.085

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Lilliefors Significance Correction.
* This is a lower bound of the true significance.

Assumption of Adequate Sample Size

To perform a two-way mixed ANOVA, each cell of the study must have at least 20 or more cases (Verma, 2016). As Table 10 indicates below, each cell exceeded the $n = 20$ minimum threshold. Therefore, the assumption of adequate sample size was met.

Table 10

Frequency Counts in Each Cell for Each Dependent Variable

Variable	Group	N
Baseline Strengths Use	A	35
	B	44
	C	29
	D	40
First Posttest Strengths Use	A	35
	B	44
	C	29
	D	40
Second Posttest Strengths Use	A	35
	B	44
	C	29
	D	40
Baseline Performance	A	35
	B	44
	C	29
	D	40
First Posttest Performance	A	35
	B	44
	C	29
	D	40
Second Posttest Performance	A	35
	B	44
	C	29
	D	40
Baseline Flourishing	A	35
	B	44
	C	29
	D	40
First Posttest Flourishing	A	35
	B	44
	C	29
	D	40
Second Posttest Flourishing	A	35
	B	44
	C	29
	D	40

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

Assumption of Homogeneity of Variances

Homogeneity of variance refers to whether the distribution or spread of a dependent variable around the mean is equal across groups (SAGE Research Methods, 2010), and in the case of a two-way mixed ANOVA, it means the dependent variable's error variance is equal across groups for each timepoint of measurement (Verma, 2016). It is measured using the Levene test, which is performed concurrently with the two-way mixed ANOVA. The Levene test null hypothesis is that there is homogeneous or equal variance, and the alternative hypothesis is that there is heterogeneous or unequal variance. An alpha level of .05 is assumed as is standard practice (Warner, 2013). Table 11 displays the results of the Levene test for all dependent variables. For strengths use, the baseline measure was $F(3, 144 = 2.90, p = .037)$, indicating it was significant and, therefore, there were unequal variances. However, the other two points of measurement for strengths use each had *p* values greater than .05, indicating they were not significant and had equal variances. For job performance, the first posttest measurement was significant, $F(3, 144 = 3.11, p = .028)$ indicating unequal variances. The other two measurements of performance were not significant (i.e., *p* values greater than .05), and therefore demonstrated equal variances. Finally, all three measures of flourishing at work were not significant and had equal variances. Thus, the assumption of homogeneity of variances was met for flourishing at work, but partially violated for strengths use and job performance.

Table 11

Levene's Test of Equality of Variances[a]

	Levene Statistic	df1	df2	Sig.
Baseline Strengths Use	2.900	3	144	.037
First Posttest Strengths Use	1.098	3	144	.352
Second Posttest Strengths Use	1.161	3	144	.327
Baseline Performance	.9730	3	144	.408
First Posttest Performance	3.108	3	144	.028
Second Posttest Performance	2.435	3	144	.067
Baseline Flourishing	.5220	3	144	.668
First Posttest Flourishing	.3670	3	144	.777
Second Posttest Flourishing	.7690	3	144	.513

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + GroupNumeric.
Within Subjects Design: Time.

Assumption of Homogeneity of Variance-Covariance Matrices

In addition to the assumption of homogeneity of variances, the two-way mixed ANOVA also has an assumption of equality of variances and covariances. Namely, the variance-covariance matrices should be equal for each dependent variable across the independent variable groups (Warner, 2013). This is evaluated by the Box's *M* test. The null hypothesis for this test is that there are equal covariance matrices in the data, and the alternative hypothesis is that there are unequal covariance matrices. This test can be quite sensitive, and therefore, instead of the standard alpha level of .05, a lower *p* value of < .001 is assumed (Verma, 2016). Table 12 displays the output from the Box's *M* test, which shows that the results for strengths use and flourishing were not significant, with *p* values of .469 and .598 respectively. Consequently, there was failure to reject the null hypothesis, and the assumption of equal covariance matrices was met for these variables. However, Box's *M* test was significant for performance ($p < .001$).

Therefore, the null hypothesis was rejected, and the assumption of equal variances and covariances was violated for job performance (Warner, 2013).

Table 12

Box's M Test of Equality of Covariance Matrices[a]

	Box's M	F	df1	df2	Sig.
Strengths Use	18.526	.989	18	60064.535	.469
Performance	86.858	4.637	18	60064.535	.000
Flourishing	16.567	.885	18	60064.535	.598

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.[a]

a. Design: Intercept + GroupNumeric.
Within Subjects Design: Time.

Assumption of No Sphericity

In a two-way mixed ANOVA, sphericity is tested if there are more than two levels of the within-subjects independent factor (Verma, 2016). This study design had three levels of the within-subjects independent variable (i.e., time). Therefore, sphericity was evaluated by Mauchly's *W* test, which is run concurrently with the two-way mixed ANOVA procedure. Mauchly's *W* test provides a statistical measure to assess if the variances of the differences between each timepoint measurement are equal. The Mauchly's *W* test null hypothesis is that there is equal variance of differences in scores across the three points in time for each dependent variable and the alternative hypothesis is that there is unequal variance of differences between the timepoint measurements. An alpha level of .05 is used as is standard practice (Warner, 2013). Table 13 displays the results for sphericity. The Mauchly's test result for strengths use was $W = .97$, $\chi^2(2) = 4.93$, $p = .085$, for performance it was $W = 1.00$, $\chi^2(2) = .062$, $p = .969$, and for flourishing it was $W = .98$, $\chi^2(2) = 2.81$, $p = .245$. Therefore, each dependent variable had *p* values above .05, there was failure to reject the null hypothesis, and equal variances were

assumed across timepoints. Thus, the assumption of sphericity was met for all dependent variables.

Table 13

Mauchly's W Test of Sphericity[a]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse -Geisser	Huynh-Feldt	Lower-bound
Strengths Use	.966	4.934	2	.085	.967	1.000	.500
Performance	1.000	.0620	2	.969	1.000	1.000	.500
Flourishing	.981	2.811	2	.245	.981	1.000	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + GroupNumeric.
Within Subjects Design: Time.

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Evaluation of Assumptions

A review of the nine assumptions associated with a two-way mixed ANOVA yielded varied results for each dependent variables. The first three assumptions related to the study design were all met: one dependent variable measure on the continuous level, one categorical between-subjects factor with two or more categories and independence of observations, and one categorical within-subjects factor with two or more categories and independence of observations. The assumptions that could be evaluated statistically yielded mixed results.

Strengths Use

The assumptions of no outliers and normality were violated. The assumption of adequate sample size was met, with each cell of the dependent variable containing more $n = 20$ cases. The assumption of homogeneity of variance had mixed results. The baseline measurement of strengths use violated the assumption, while the first and second posttest measurements each met the assumption. The assumption of equality of variances and covariances was met. Finally, the

assumption of sphericity was met. Thus, half of the assumptions that can be tested in IBM SPSS (n.d.) were met (i.e., adequate sample size, equality of variances and covariances, and sphericity), and half were partially or fully violated (i.e., outliers, normality, and homogeneity of variances).

Job Performance

The assumptions of no outliers and normality were violated. The assumption of adequate sample size was met, with each cell of the dependent variable containing more $n = 20$ cases. The assumption of homogeneity of variance had mixed results. The first posttest measurement of job performance violated the assumption, while the baseline and second posttest measurements each met the assumption. The assumption of equality of variances and covariances was violated. Finally, the assumption of sphericity was met. Thus, two of the assumptions that can be tested in IBM SPSS (IBM, n.d.) were met (i.e., adequate sample size and sphericity). The remaining four assumptions were partially or fully violated (i.e., outliers, normality, homogeneity of variances, and equality of variances and covariances).

Flourishing at Work

The assumptions of no outliers and normality were violated. The assumption of adequate sample size was met, with each cell of the dependent variable containing more than $n = 20$ cases. The assumptions of homogeneity of variance, equality of variances and covariances, and sphericity were met. Therefore, most of the assumptions that can be tested in IBM SPSS (IBM, n.d.) were met (i.e., adequate sample size, homogeneity of variance, equality of variances and covariances, and sphericity), while two were violated (i.e., outliers and normality).

Addressing the Assumption Violations

Assumptions of outliers and normality are required for parametric tests, such as a two-way mixed ANOVA (Warner, 2013). Therefore, before proceeding with further with the inferential tests, efforts were made to remedy the outlier and normality assumption violations for each dependent variable. Two different approaches were evaluated: outlier removal and data transformation.

Outlier Removal

Initially, outliers identified as beyond the range of ±3.0 standard deviations from the mean were removed from the data. This method of removal was selected because data within ±3.0 standard deviations of the mean represent 99.7% of the distribution (Warner, 2013). Therefore, cases beyond this range could be considered true outliers. However, this approach did not fully address the violations of normality. Therefore, outliers identified beyond the range of ±2.5 standard deviations from the mean were removed from the data. This secondary approach was attempted because in each cell of the data there were fewer than $n = 80$ cases. With sample sizes this small, outliers are often identified as cases beyond ±2.5 standard deviations of the mean (Hair et al., 2019). Nevertheless, this approach was also insufficient in addressing the normality violations. It also resulted in the loss of between five to seven cases per dependent variable from an already small data set. Moreover, the literature cautioned against outlier removal to avoid sample size reduction (Laerd Statistics, n.d.-c) and unless the cases were truly abnormal (Hair et al., 2019). Indeed, none of the outliers identified were considered aberrant in the data set. Therefore, all outliers were retained, and data transformation was used to address the normality violation.

Data Transformation

Five different data transformations methods were attempted, including the (a) square root, (b) logarithmic, and (c) inverse transformations recommended by Laerd Statistics (n.d.-b). Additionally, the (d) Box-Cox transformation (Box & Cox, 1964, as cited in Osborne, 2010) and the (e) two-step normality transformation (Templeton, 2011) were reviewed. Although each transformation method indicated some improvement to normality, the logarithmic transformation was most effective for strengths use and flourishing at work, and the inverse transformation was most productive for job performance. Therefore, these transformation methods were selected and the assumptions were evaluated once more with the transformed data.

Evaluation of Assumptions for Transformed Data

The logarithmic transformation was applied to strengths use and flourishing at work, and the inverse transformation was applied to job performance. Normality was assessed by reviewing skewness and kurtosis scores, and the Shapiro-Wilk's test. The remaining assumptions were evaluated by Levene's test (homogeneity of variances) Box's *M* test (homogeneity of variances and covariances), and Mauchly's *W* test (sphericity).

Normality

After performing the logarithmic and inverse transformations, all skewness and kurtosis scores were within the ± 2 acceptable range. Table 14 displays the skewness and kurtosis scores for the transformed data for each dependent variable.

Table 14

Descriptive Statistics for Transformed Dependent Variables[a] by Group

					Skewness		Kurtosis	
Variable	Group	N	Mean	Std. Deviation	Statistic	Std. Error	Statistic	Std. Error
Baseline	A	35	.3640	.15603	-.188	.398	-.839	.778
Strengths Use	B	44	.3135	.15544	.504	.357	1.493	.702
	C	29	.3331	.14176	.207	.434	-.478	.845
	D	40	.3531	.19934	.080	.374	-.709	.733
First Posttest	A	35	.3333	.17331	-.210	.398	-1.070	.778
Strengths Use	B	44	.3019	.16130	.697	.357	1.406	.702
	C	29	.3548	.14051	-1.005	.434	.757	.845
	D	40	.3539	.17376	.009	.374	-.499	.733
Second	A	35	.3489	.17621	-.457	.398	-.705	.778
Posttest	B	44	.3155	.15355	.423	.357	1.414	.702
Strengths Use	C	29	.3245	.15305	-.195	.434	.280	.845
	D	40	.3566	.18422	-.055	.374	-.205	.733
Baseline	A	35	.7428	.19070	.113	.398	-1.303	.778
Performance	B	44	.8549	.17512	-.728	.357	-.952	.702
	C	29	.8830	.17451	-1.638	.434	1.893	.845
	D	40	.8254	.17877	-.495	.374	-1.301	.733
First Posttest	A	35	.8185	.21271	-.811	.398	-.490	.778
Performance	B	44	.8784	.16204	-1.004	.357	-.288	.702
	C	29	.8771	.17348	-.977	.434	-.552	.845
	D	40	.8565	.18307	-.829	.374	-.874	.733
Second	A	35	.7883	.20443	-.305	.398	-1.332	.778
Posttest	B	44	.8529	.17259	-.676	.357	-1.116	.702
Performance	C	29	.8664	.16193	-1.040	.434	.238	.845
	D	40	.8408	.19995	-.863	.374	-.699	.733
Baseline	A	35	.5297	.21518	-.460	.398	-.016	.778
Flourishing	B	44	.5186	.22198	-.249	.357	.190	.702
	C	29	.5143	.17248	.128	.434	.381	.845
	D	40	.5697	.20577	-.084	.374	-.018	.733
First Posttest	A	35	.5188	.21329	-.128	.398	-.753	.778
Flourishing	B	44	.5187	.20882	-.130	.357	.493	.702
	C	29	.5180	.19982	-.097	.434	-.652	.845
	D	40	.5652	.20521	.043	.374	-.614	.733
Second	A	35	.5334	.20422	-.235	.398	-.876	.778
Posttest	B	44	.5282	.20125	-.174	.357	.714	.702
Flourishing	C	29	.5176	.17157	-.060	.434	-.154	.845
	D	40	.5648	.20154	-.173	.374	-.715	.733

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Logarithmic transformations used for the strengths use and flourishing variables. Inverse transformation used for the performance variable.

Additionally, the Shapiro-Wilk's test of normality was performed with the transformed variables. As displayed in Table 15, the test results improved for strengths use and flourishing, with each cell of the flourishing at work variables and all but one cell of the strengths use variables showing *p* values of greater than .05, thereby indicating normal distribution. However, the *p* values for every cell of the transformed job performance variable were lower than .05, as before, suggesting that there was not normal distribution. This violation of Shapiro-Wilk's was the same for every data normalization approach used for job performance (i.e., two outlier removal methods and five transformation methods). Still, some statisticians have suggested that the Shapiro-Wilk's test should not be the sole method for determining normality (e.g., Field, 2018; Laerd Statistics, n.d.-a), and that it can yield different results than other ways of testing for normality (Siraj-Ud-Doulah, 2019). Moreover, the two-way mixed ANOVA is considered "robust" against normality violations (Laerd Statistics, n.d.-a). Therefore, based on the acceptable skewness and kurtosis scores in all the transformed dependent variables, close to normality was assumed, and the remaining assumptions were evaluated with the transformed data.

Table 15

Normality Tests for Transformed Dependent Variables[b] by Group

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Variable	Group	Statistic	df	Sig.	Statistic	df	Sig.
Baseline	A	.107	35	.200*	.971	35	.483
Strengths Use	B	.112	44	.200*	.960	44	.132
	C	.117	29	.200*	.968	29	.495
	D	.094	40	.200*	.967	40	.293
First Posttest	A	.114	35	.200*	.952	35	.131
Strengths Use	B	.112	44	.200*	.958	44	.108
	C	.151	29	.091	.920	29	.030
	D	.099	40	.200*	.977	40	.591
Second Posttest	A	.095	35	.200*	.954	35	.145
Strengths Use	B	.108	44	.200*	.956	44	.093
	C	.129	29	.200*	.966	29	.460
	D	.086	40	.200*	.978	40	.628
Baseline	A	.168	35	.013	.905	35	.005
Performance	B	.319	44	.000	.784	44	.000
	C	.300	29	.000	.710	29	.000
	D	.236	40	.000	.831	40	.000
First Posttest	A	.289	35	.000	.805	35	.000
Performance	B	.342	44	.000	.757	44	.000
	C	.381	29	.000	.719	29	.000
	D	.333	40	.000	.757	40	.000
Second Posttest	A	.250	35	.000	.854	35	.000
Performance	B	.303	44	.000	.788	44	.000
	C	.278	29	.000	.809	29	.000
	D	.312	40	.000	.776	40	.000
Baseline	A	.098	35	.200*	.971	35	.478
Flourishing	B	.118	44	.143	.972	44	.351
	C	.099	29	.200*	.983	29	.903
	D	.102	40	.200*	.976	40	.534
First Posttest	A	.091	35	.200*	.969	35	.417
Flourishing	B	.091	44	.200*	.984	44	.788
	C	.105	29	.200*	.970	29	.560
	D	.099	40	.200*	.983	40	.804
Second Posttest	A	.105	35	.200*	.956	35	.172
Flourishing	B	.082	44	.200*	.983	44	.771
	C	.096	29	.200*	.989	29	.989
	D	.081	40	.200*	.977	40	.586

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.

a. Lilliefors Significance Correction.

b. Logarithmic transformations used for strengths use and flourishing variables. Inverse transformation used for performance variable.

* This is a lower bound of the true significance.

Homogeneity of Variances

Levene's test was conducted with the logarithmic and inverse transformed data, and the results are displayed in Table 16. The transformed data had *p* values greater than .05 for all the transformed dependent variables, indicating the results were not significant and each transformed variable had equal variances.

Table 16

Levene's Test of Equality of Variances[a] for Transformed Dependent Variables[b]

	Levene Statistic	df1	df2	Sig.
Baseline Strengths Use	2.378	3	144	.072
First Posttest Strengths Use	1.043	3	144	.375
Second Posttest Strengths Use	.829	3	144	.480
Baseline Performance	.921	3	144	.433
First Posttest Performance	1.73	3	144	.164
Second Posttest Performance	2.394	3	144	.071
Baseline Flourishing	.436	3	144	.728
First Posttest Flourishing	.174	3	144	.914
Second Posttest Flourishing	.492	3	144	.688

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.[a]

a. Design: Intercept + GroupNumeric.
Within Subjects Design: Time.

b. Logarithmic transformations used for strengths use and flourishing variables. Inverse transformation used for performance variable.

Homogeneity of Variances and Covariances

Table 17 displays the output from the Box's *M* test conducted on the transformed variables. The results were not significant for strengths use and flourishing, with *p* values of .572 and .197 respectively. Consequently, the assumption of equal covariance matrices was met for these transformed variables. However, Box's *M* test was still significant for job performance ($p <$

.001). Therefore, the null hypothesis was rejected, and the assumption of equal variances and covariances was still violated for the transformed performance variable.

Table 17

Box's M Test of Equality of Covariance Matrices[a] for Transformed Dependent Variables[b]

	Box's M	F	df1	df2	Sig.
Strengths Use	16.961	0.906	18	60064.535	.572
Performance	52.659	2.811	18	60064.535	.000
Flourishing	23.760	1.269	18	60064.535	.197

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.[a]
a. Design: Intercept + GroupNumeric.
Within Subjects Design: Time.
b. Logarithmic transformations used for strengths use and flourishing variables. Inverse transformation used for performance variable.

Sphericity

The Mauchly's *W* test results for the transformed data are shown in Table 18. The assumption of sphericity was met for strengths use and job performance (*p* values greater than .05), but not for flourishing at work. The result for flourishing at work was $W = .92$, $\chi^2(2) = 11.58$, $p = .003$. Therefore, the assumption of no sphericity was met for the transformed strengths use and job performance variables, and violated for the transformed flourishing at work variable.

Table 18

Mauchly's W Test of Sphericity[a] for Transformed Dependent Variables[c]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon[b] Greenhouse -Geisser	Huynh-Feldt	Lower-bound
Strengths Use	.994	.9090	2	.635	0.994	1.000	.500
Performance	.978	3.225	2	.199	0.978	1.000	.500
Flourishing	.922	11.58	2	.003	0.928	.959	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.[a]

a. Design: Intercept + GroupNumeric.
Within Subjects Design: Time.

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

c. Logarithmic transformations used for strengths use and flourishing variables. Inverse transformation used for performance variable.

Summary of Assumptions for Transformed Variables

In brief, transforming the data resulted in improvement in normality and most assumptions for all the variables. The logarithmic-transformed strengths use variable met the assumption of normality with all cells displaying skewness and kurtosis scores within the ± 2 acceptable range, and it met the assumptions of homogeneity of variances, homogeneity of variances and covariances, and sphericity. The inverse-transformed variable of job performance returned all skewness scores within the ± 2 acceptable range. Additionally, job performance met the assumptions of homogeneity of variances and sphericity, but it violated the assumption of homogeneity of variances and covariances. Finally, the logarithmic-transformed variable of flourishing at work showed all skewness scores within the ± 2 acceptable range. Flourishing at work also met the assumptions of homogeneity of variances and homogeneity of variances and covariances, though it violated the assumption of sphericity. Consequently, transforming the data did not produce perfect results for the assumptions, but it did improve them for all the variables, and the remaining violations were not prohibitive. Indeed, violations of homogeneity of

variances and covariances are difficult to remedy, but usually a two-way mixed ANOVA is run anyway, with that limitation noted (Laerd Statistics, n.d.-c). Additionally, a violation of sphericity can be corrected by reporting an adjusted statistic, the Greenhouse-Geisser, which is produced concurrently with the two-way mixed ANOVA (Verma, 2016). Therefore, the two-way mixed ANOVA was performed using the transformed data.

Inferential Procedure

A two-way mixed ANOVA was conducted on each transformed dependent variable. This inferential test is used to examine the impact of two independent factors on a dependent variable, where one of the independent factors is within-subjects and the other is between-subjects (Verma, 2016). In this study, the within-subjects independent factor was time and had three levels (i.e., baseline, first posttest, and second posttest). The between-subjects independent factor was group, with four levels (i.e., placebo-control group and three strengths intervention groups). As stated more formally in the background of the study section of this chapter, the three questions addressed by the two-way mixed ANOVA were (a) whether there was a significant interaction effect between group and time, (b) whether each variable differed significantly across time periods, regardless of group, and (c) whether each variable differed significantly across groups, regardless of time.

If a significant interaction is detected, it indicates that during different time periods, the dependent variable differs across the groups. The effect of time and group are known as main effects. The effect of time in each group and group in each time condition are referred to as the simple main effects. The simple main effects are examined only if a significant interaction is reported. If the interaction is not significant, the main effects are reported (Verma, 2016). A two-

way mixed ANOVA was performed for each transformed variable to answer the three research questions, and a standard alpha level of .05 was assumed.

Strengths Use Results

Tests of within-subjects were consulted first to establish if there was a significant interaction between time and group. The transformed strengths use variable met the assumption of no sphericity [$W = .99$, $\chi^2(2) = .91$, $p = .635$]. Therefore, the sphericity assumed results were examined. As shown in Table 19, there was no statistically significant interaction between the group and time for strengths use, $F(6, 288) = 1.17$, $p = .325$, partial $\eta 2 = .024$, and an observed power of .458. Thus, for the first research question, there was failure to reject the null hypothesis because there was no statistically significant interaction effect between group and time for levels of strengths use. Therefore, the next step was to examine the main effects for the between- and within-subjects factors (Verma, 2016). As also displayed in Table 19, with sphericity assumed, the main effect of time showed no statistically significant difference in mean strengths use at the different time points, $F(2, 288) = .24$, $p = .791$, partial $\eta 2 = .002$, and an observed power of .087. Consequently, for the second research question, there was failure to reject the null hypothesis because there was no statistically significant difference between time points for levels of strengths use.

Table 19

Tests of Within-Subjects Effects for Strengths Use[b]

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Obtained Power[a]
Time	Sphericity Assumed	.002	2	.001	.235	.791	.002	.087
	Greenhouse-Geisser	.002	1.987	.001	.235	.789	.002	.087
	Huynh-Feldt	.002	2.000	.001	.235	.791	.002	.087
	Lower-Bound	.002	1.000	.002	.235	.629	.002	.077
Time*Group	Sphericity Assumed	.033	6	.005	1.166	.325	.024	.458
	Greenhouse-Geisser	.033	5.962	.005	1.166	.325	.024	.456
	Huynh-Feldt	.033	6.000	.005	1.166	.325	.024	.458
	Lower-Bound	.033	3.000	.011	1.166	.325	.024	.309
Error(Time)	Sphericity Assumed	1.348	288	.005				
	Greenhouse-Geisser	1.348	286.186	.005				
	Huynh-Feldt	1.348	288.000	.005				
	Lower-Bound	1.348	144.000	.009				

a. Computed using alpha = .05.
b. Data shown is for the logarithmic transformation of strengths use.

Next, the main effect of group was examined, as displayed in Table 20. The main effect of group indicated that there was no statistically significant difference in mean strengths use between intervention groups, $F(3, 144) = .66$, $p = .577$, partial $\eta 2 = .014$, and an observed power of .187. As such, for the third research question, there was failure to reject the null hypothesis due to no statistically significant difference in the levels of strengths use across groups.

Table 20

Tests of Between-Subjects Effects for Strengths Use[b]

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Intercept	49.428	1	49.428	674.636	.000	.824	1.000
Group	.145	3	.048	.661	.577	.014	.187
Error	10.550	144	.073				

a. Computed using alpha = .05.
b. Data shown is for the logarithmic transformation of strengths use.

Finally, the estimated marginal means for strengths use were examined. For this aspect of the procedure, the data were back-transformed to original units for meaningful analysis. Table 21 displays the estimated marginal means for each group across time periods. The mean scores for Group A ranged from *M* = 5.54, *SE* = .16, 95% CI [5.22, 5.86] at baseline, to *M* = 5.68, *SE* = .15, 95% CI [5.38, 5.98] at first posttest, to *M* = 5.59, *SE* = .16, 95% CI [5.28, 5.90] at second posttest. Group B scores were *M* = 5.80, *SE* = .14, 95% CI [5.51, 6.08] at baseline, to *M* = 5.84, *SE* = .14, 95% CI [5.57, 6.11] at first posttest, to *M* = 5.79, *SE* = .14, 95% CI [5.52, 6.07] at second posttest. Group C mean scores ranged from *M* = 5.73, *SE* = .18, 95% CI [5.38, 6.08] at baseline, to *M* = 5.63, *SE* = .17, 95% CI [5.30, 5.96] at first posttest, to *M* = 5.76, *SE* = .17, 95% CI [5.42, 6.10] at second posttest. Finally, Group D mean scores were *M* = 5.50, *SE* = .15, 95% CI [5.20, 5.80] at baseline, to *M* = 5.56, *SE* = .14, 95% CI [5.28, 5.84] at first posttest, to *M* = 5.52, *SE* = .15, 95% CI [5.23, 5.81] at second posttest.

Table 21

Estimated Marginal Means for Strengths Use[a] by Time and Group

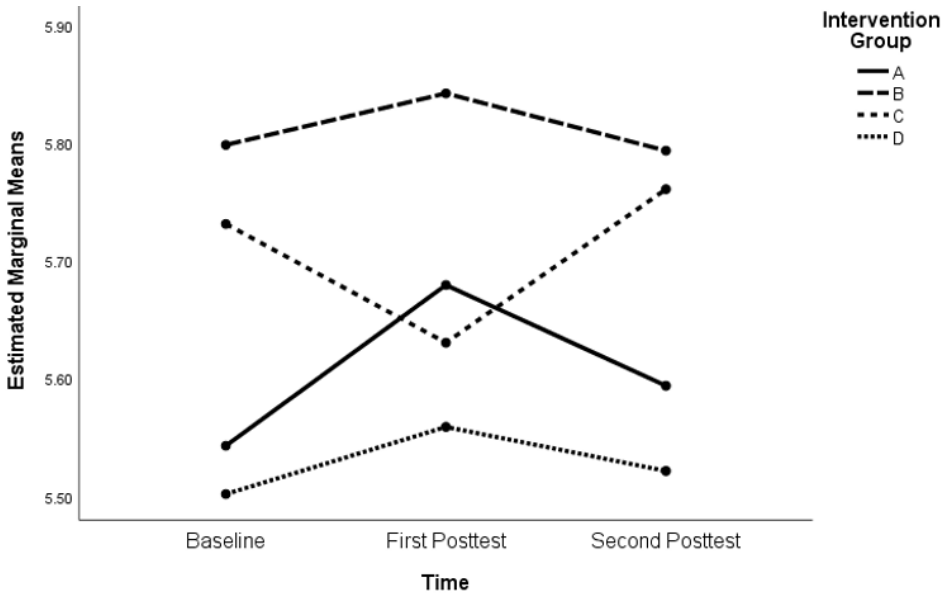
				95% Confidence Interval	
Group	Time	Mean	Std. Error	Lower Bound	Upper Bound
A	Baseline	5.543	.162	5.224	5.862
	First Posttest	5.680	.153	5.378	5.982
	Second Posttest	5.594	.157	5.283	5.904
B	Baseline	5.799	.144	5.514	6.083
	First Posttest	5.843	.136	5.573	6.112
	Second Posttest	5.794	.140	5.517	6.071
C	Baseline	5.732	.177	5.381	6.082
	First Posttest	5.631	.168	5.299	5.962
	Second Posttest	5.761	.173	5.420	6.102
D	Baseline	5.502	.151	5.203	5.800
	First Posttest	5.559	.143	5.276	5.841
	Second Posttest	5.521	.147	5.231	5.812

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Data shown is for back-transformed strengths use.

Figure 14 shows the estimated marginal means plotted in a line chart. Groups A, B, and D demonstrated an increase in mean scores from baseline to first posttest and then a decline to the second posttest. Group C declined from baseline to first posttest and increased from first posttest to second posttest. Still, as noted above in the ANOVA results from the logarithmic-transformed data, none of these changes were significant across time or between groups.

Figure 14

Estimated Marginal Means Plot for Strengths Use[a] by Time and Group



Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Data shown is for back-transformed strengths use.

Job Performance Results

First, tests of within-subjects were examined for a significant interaction between time and group. The transformed job performance variable met the assumption of no sphericity [W = .98, $\chi^2(2) = 3.23$, $p = .199$]. Therefore, the sphericity assumed results were used. As shown in Table 22, there was no statistically significant interaction between the group and time for job performance, $F(6, 288) = 1.31$, $p = .255$, partial $\eta 2 = .026$, and observed power of .510. Thus, for the first research question, there was failure to reject the null hypothesis because there was no statistically significant interaction effect between group and time for levels of job performance. Consequently, main effects for the between- and within-subjects factors were reviewed (Verma, 2016). As displayed in Table 22, with sphericity assumed, the main effect of time showed a statistically significant difference in mean job performance across time points, $F(2, 288) = 4.42$,

p = .013, partial η2 = .030, and observed power of .758. Thus, for the second research question, the null hypothesis was rejected because there was a statistically significant difference between time points for levels of job performance.

Table 22

Tests of Within-Subjects Effects for Job Performance[b]

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.072	2	.036	4.421	.013	.030	.758
	Greenhouse-Geisser	.072	1.956	.037	4.421	.013	.030	.751
	Huynh-Feldt	.072	2.000	.036	4.421	.013	.030	.758
	Lower-Bound	.072	1.000	.072	4.421	.037	.030	.551
Time*Group	Sphericity Assumed	.064	6	.011	1.305	.255	.026	.510
	Greenhouse-Geisser	.064	5.869	.011	1.305	.256	.026	.503
	Huynh-Feldt	.064	6.000	.011	1.305	.255	.026	.510
	Lower-Bound	.064	3.000	.021	1.305	.275	.026	.343
Error(Time)	Sphericity Assumed	2.353	288	.008				
	Greenhouse-Geisser	2.353	281.718	.008				
	Huynh-Feldt	2.353	288.000	.008				
	Lower-Bound	2.353	144.000	.016				

a. Computed using alpha = .05.
b. Data shown is for the inverse transformation of job performance.

Next, the main effect of group was examined, as displayed in Table 23. The main effect of group indicated that there was no statistically significant difference in mean job performance between intervention groups $F(3, 144) = 2.03$, p = .112, partial η2 = .041, and observed power of .513. As such, for the third research question, there was failure to reject the null hypothesis due to no statistically significant difference in the levels of job performance across groups.

Table 23

Tests of Between-Subjects Effects for Job Performance[b]

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Intercept	306.038	1	306.038	3638.031	.000	.962	1.000
Group	.513	3	.171	2.032	.112	.041	.513
Error	12.114	144	.084				

a. Computed using alpha = .05.
b. Data shown is for the inverse transformation of job performance.

The estimated marginal means for job performance were also examined, and the data were back-transformed for meaningful analysis. Table 24 displays the estimated marginal means for each group across time periods. The mean scores for Group A were *M* = 4.56, *SE* = .06, 95% CI [4.44, 4.68] at baseline, *M* = 4.65, *SE* = .06, 95% CI [4.53, 4.78] at first posttest, and *M* = 4.63, *SE* = .06, 95% CI [4.51, 4.75] at second posttest. Group B scores ranged from *M* = 4.77, *SE* = .05, 95% CI [4.67, 4.87] at baseline, to *M* = 4.81, *SE* = .06, 95% CI [4.70, 4.92] at first posttest, to *M* = 4.77, *SE* = .06, 95% CI [4.66, 4.88] at second posttest. Group C mean scores were *M* = 4.80, *SE* = .06, 95% CI [4.67, 4.93] at baseline, *M* = 4.80, *SE* = .07, 95% CI [4.67, 4.94] at first posttest, and *M* = 4.79, *SE* = .07, 95% CI [4.66, 4.93] at second posttest. Finally, Group D mean scores ranged from *M* = 4.72, *SE* = .06, 95% CI [4.61, 4.83] at baseline, to *M* = 4.76, *SE* = .06, 95% CI [4.65, 4.88] at first posttest, to *M* = 4.72, *SE* = .06, 95% CI [4.60, 4.83] at second posttest.

Table 24

Estimated Marginal Means for Job Performance[a] by Time and Group

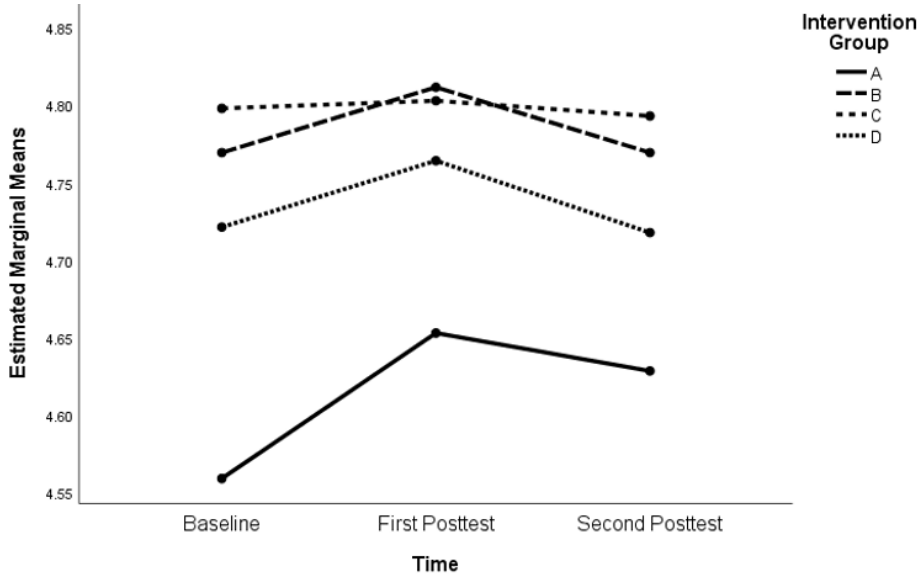
Group	Time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
A	Baseline	4.559	.059	4.443	4.675
	First Posttest	4.653	.064	4.528	4.779
	Second Posttest	4.629	.062	4.507	4.750
B	Baseline	4.769	.052	4.666	4.873
	First Posttest	4.812	.057	4.700	4.924
	Second Posttest	4.769	.055	4.661	4.878
C	Baseline	4.798	.064	4.671	4.925
	First Posttest	4.803	.070	4.665	4.941
	Second Posttest	4.793	.068	4.659	4.927
D	Baseline	4.721	.055	4.613	4.830
	First Posttest	4.764	.059	4.647	4.882
	Second Posttest	4.718	.058	4.604	4.832

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Data shown is for back-transformed job performance.

Figure 15 shows the estimated marginal means for job performance plotted in a line chart. All groups showed at least a slight increase in mean scores from baseline to first posttest and then a decline to the second posttest. Still, as noted above none of the mean scores from the inverse-transformed data were significant across group. Only time was found to be a significant main effect. Ad hoc results determined between which time points there was a significant result. These are discussed later in the chapter.

Figure 15

Estimated Marginal Means Plot for Job Performance[a] by Time and Group



Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Data shown is for back-transformed job performance.

Flourishing at Work Results

Tests of within-subjects were evaluated for a significant interaction between time and group. The transformed flourishing at work variable did not met the assumption of no sphericity [$W = .92$, $\chi^2(2) = 11.58$, $p = .003$]. Therefore, Greenhouse-Geisser results were consulted. As shown in Table 25, there was no statistically significant interaction between the group and time for flourishing at work, $F(5.57, 267.21) = .29$, $p = .932$, partial $\eta 2 = .006$, and observed power of .126. Therefore, for the first research question, there was failure to reject the null hypothesis because there was no statistically significant interaction effect between group and time for levels of flourishing at work. Subsequently, main effects for the between- and within-subjects factors were examined (Verma, 2016). As displayed in Table 25, using the Greenhouse-Geisser correction, the main effect of time did not show a statistically significant difference in mean

flourishing at work at the different time points, $F(1.86, 267.21) = .46$, $p = .620$, partial $\eta 2 = .003$, and observed power of .121. Consequently, for the second research question, there was failure to reject the null hypothesis because there was no statistically significant difference between time points for levels of flourishing at work.

Table 25

Tests of Within-Subjects Effects for Flourishing at Work[b]

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.003	2	.001	.456	.634	.003	.124
	Greenhouse-Geisser	.003	1.856	.001	.456	.620	.003	.121
	Huynh-Feldt	.003	1.918	.001	.456	.626	.003	.123
	Lower-Bound	.003	1.000	.003	.456	.501	.003	.103
Time*Group	Sphericity Assumed	.005	6	.001	.290	.941	.006	.130
	Greenhouse-Geisser	.005	5.567	.001	.290	.932	.006	.126
	Huynh-Feldt	.005	5.754	.001	.290	.936	.006	.128
	Lower-Bound	.005	3.000	.002	.290	.832	.006	.105
Error(Time)	Sphericity Assumed	.790	288	.003				
	Greenhouse-Geisser	.790	267.214	.003				
	Huynh-Feldt	.790	276.196	.003				
	Lower-Bound	.790	144.000	.005				

a. Computed using alpha = .05.
b. Data shown is for the logarithmic transformation of flourishing at work.

Next, the main effect of intervention group was examined, as displayed in Table 26. The main effect of group indicated that there was no statistically significant difference in mean flourishing at work between intervention groups $F(3, 144) = .50$, $p = .684$, partial $\eta 2 = .010$, and observed power of .149. As such, for the third research question, there was failure to reject the null hypothesis due to no statistically significant difference in the levels of flourishing at work across groups.

Table 26

Tests of Between-Subjects Effects for Flourishing at Work[b]

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Intercept	123.13	1	123.130	1034.584	.000	.878	1.000
Group	.178	3	.059	.498	.684	.010	.149
Error	17.138	144	.119				

a. Computed using alpha = .05.
b. Data shown is for the logarithmic transformation of flourishing at work.

The estimated marginal means for flourishing at work were reviewed. For this step, the data were back-transformed for meaningful analysis. Table 27 displays the estimated marginal means for each group across time periods. The mean scores for Group A were *M* = 7.10, *SE* = .31, 95% CI [6.49, 7.71] at baseline, *M* = 7.18, *SE* = .31, 95% CI [6.57, 7.79] at first posttest, and *M* = 7.16, *SE* = .29, 95% CI [6.59, 7.73] at second posttest. Group B scores ranged from *M* = 7.15, *SE* = .28, 95% CI [6.61, 7.69] at baseline, to *M* = 7.19, *SE* = .28, 95% CI [6.45, 7.73] at first posttest, to *M* = 7.20, *SE* = .26, 95% CI [6.69, 7.71] at second posttest. Group C mean scores were *M* = 7.35, *SE* = .34, 95% CI [6.68, 8.02] at baseline, *M* = 7.24, *SE* = .34, 95% CI [6.57, 7.91] at first posttest, and *M* = 7.39, *SE* = .32, 95% CI [6.77, 8.02] at second posttest. Finally, Group D mean scores ranged from *M* = 6.75, *SE* = .29, 95% CI [6.18, 7.32] at baseline, to *M* = 6.79, *SE* = .29, 95% CI [6.22, 7.36] at first posttest, to *M* = 6.88, *SE* = .27, 95% CI [6.34, 7.41] at second posttest.

Table 27

Estimated Marginal Means for Flourishing at Work[a] by Time and Group

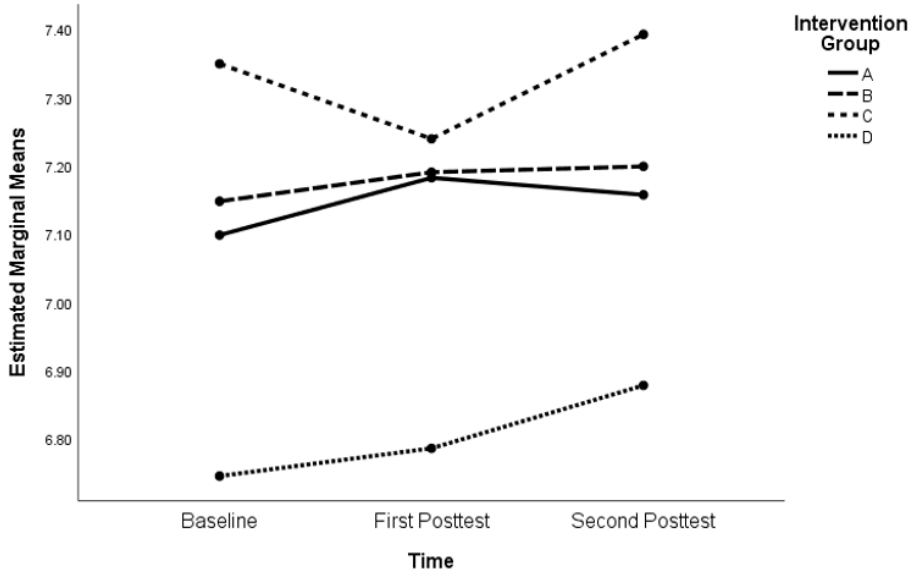
Group	Time	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
A	Baseline	7.098	.308	6.490	7.707
	First Posttest	7.182	.309	6.572	7.792
	Second Posttest	7.157	.289	6.586	7.728
B	Baseline	7.148	.275	6.605	7.691
	First Posttest	7.190	.275	6.646	7.734
	Second Posttest	7.199	.258	6.689	7.708
C	Baseline	7.349	.338	6.680	8.018
	First Posttest	7.239	.339	6.569	7.909
	Second Posttest	7.392	.317	6.765	8.020
D	Baseline	6.745	.288	6.176	7.315
	First Posttest	6.786	.289	6.216	7.356
	Second Posttest	6.878	.270	6.344	7.412

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Data shown is for back-transformed flourishing at work.

Figure 16 shows the estimated marginal means for flourishing at work plotted in a line chart. Groups B and D showed a slight increase in mean scores from baseline to first posttest and from first posttest to second posttest. Group A demonstrated an increase in mean scores from baseline to first posttest and then a decline to the second posttest. Group C declined from baseline to first posttest and ticked back up at the second posttest. Still, as noted above in the results from the logarithmic-transformed data, none of these changes in mean scores were significant across time or between groups.

Figure 16

Estimated Marginal Means Plot for Flourishing at Work[a] by Time and Group



Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
a. Data shown is for back-transformed flourishing at work.

Ad Hoc Analyses

In a two-way mixed ANOVA, ad hoc tests are conducted to identify between which groups and time periods there are significant differences (Verma, 2016). Such ad hoc tests are usually only consulted when a significant finding is detected in the main effects tests (Warner, 2013). Still, for the purpose of transparency, all ad hoc results are discussed in this section. For each variable, ad hoc tests were performed using the Bonferroni correction, which compensates for the possibility of increased type I error (i.e., a false positive) when multiple comparisons are performed simultaneously (Verma, 2016). For each variable, the transformed data were used because the pairwise comparisons were based off the results of the main effects inferential tests, conducted with the transformed data.

Strengths Use Ad Hoc Results

There were no significant findings for the main effects of time and group for strengths use. Therefore, no significant findings were expected in the ad hoc analysis. Table 28 displays the pairwise comparisons for within-subjects (i.e., time periods), and confirms that none of the pairwise comparisons were significant as each had *p* values greater than .05.

Table 28

Pairwise Comparisons for Time for Strengths Use[b]

					95% Confidence Interval for Difference[a]	
(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.[a]	Lower Bound	Upper Bound
Baseline	First Posttest	.005	.008	1.000	-.014	.024
	Second Posttest	.005	.008	1.000	-.015	.024
First Posttest	Baseline	-.005	.008	1.000	-.024	.014
	Second Posttest	.000	.008	1.000	-.021	.020
Second Posttest	Baseline	-.005	.008	1.000	-.024	.015
	First Posttest	.000	.008	1.000	-.020	.021

Based on estimated marginal means.
a. Adjustment for multiple comparisons: Bonferroni.
b. Data shown is for logarithmic transformed strengths use.

Next, pairwise comparisons were reviewed for differences between groups for strengths use. Table 29 displays these results and indicated, as expected, that there were no significant findings for strengths use between groups.

Table 29

Pairwise Comparisons for Group for Strengths Use[b]

					95% Confidence Interval for Difference[a]	
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
A	B	.038	.035	1.000	-0.056	0.133
	C	.011	.039	1.000	-0.094	0.116
	D	-.006	.036	1.000	-0.103	0.091
B	A	-.038	.035	1.000	-0.133	0.056
	C	-.027	.037	1.000	-0.127	0.073
	D	-.044	.034	1.000	-0.136	0.047
C	A	-.011	.039	1.000	-0.116	0.094
	B	.027	.037	1.000	-0.073	0.127
	D	-.017	.038	1.000	-0.119	0.085
D	A	.006	.036	1.000	-0.091	0.103
	B	.044	.034	1.000	-0.047	0.136
	C	.017	.038	1.000	-0.085	0.119

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
Based on estimated marginal means.
a. Adjustment for multiple comparisons: Bonferroni.
b. Data shown is for logarithmic transformed strengths use.

Job Performance Ad Hoc Results

There were no significant findings for the main effect of group for job performance. However, there was a significant result for the main effect of time. Therefore, a significant finding was expected in the ad hoc analysis for time. Table 30 displays the pairwise comparisons for within-subjects (i.e., time periods), and shows that there was a significant increase in job performance mean scores from baseline to first posttest (p = .007). Other differences in mean scores between the baseline and second posttest and the first and second posttests were not significant (p = 1.000 and p = .156, respectively).

Table 30

Pairwise Comparisons for Time for Job Performance[b]

					95% Confidence Interval for Difference[a]	
(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.[a]	Lower Bound	Upper Bound
Baseline	First Posttest	-.031*	.010	.007	-.055	-.007
	Second Posttest	-.011	.011	1.000	-.038	.017
First Posttest	Baseline	.031*	.010	.007	.007	.055
	Second Posttest	.021	.010	.156	-.005	.046
Second Posttest	Baseline	.011	.011	1.000	-.017	.038
	First Posttest	-.021	.010	.156	-.046	.005

Based on estimated marginal means.
a. Adjustment for multiple comparisons: Bonferroni.
b. Data shown is for inverse transformed job performance.
* The mean difference is significant at the .05 level.

Next, multiple comparisons were reviewed for differences between groups. Table 31 shows these results and confirmed that there were no significant findings for job performance between groups.

Table 31

Pairwise Comparisons for Group for Job Performance[b]

					95% Confidence Interval for Difference[a]	
(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
A	B	-.079	.038	.236	-.180	.023
	C	-.092	.042	.178	-.205	.020
	D	-.058	.039	.833	-.161	.046
B	A	.079	.038	.236	-.023	.180
	C	-.013	.040	1.000	-.121	.094
	D	.021	.037	1.000	-.077	.119
C	A	.092	.042	.178	-.020	.205
	B	.013	.040	1.000	-.094	.121
	D	.035	.041	1.000	-.075	.144
D	A	.058	.039	.833	-.046	.161
	B	-.021	.037	1.000	-.119	.077
	C	-.035	.041	1.000	-.144	.075

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
Based on estimated marginal means.
a. Adjustment for multiple comparisons: Bonferroni.
b. Data shown is for inverse transformed job performance.

Flourishing at Work Ad Hoc Results

There were no significant findings for the main effects of time and group for flourishing at work. Therefore, no significant findings were expected in the ad hoc analysis. Table 32 displays the pairwise comparisons for time, and the results confirmed that none of the pairwise comparisons were significant.

Table 32

Pairwise Comparisons for Time for Flourishing at Work[b]

					95% Confidence Interval for Difference[a]	
(I) Time	(J) Time	Mean Difference (I-J)	Std. Error	Sig.[a]	Lower Bound	Upper Bound
Baseline	First Posttest	.003	.007	1.000	-.013	.019
	Second Posttest	-.003	.007	1.000	-.019	.013
First Posttest	Baseline	-.003	.007	1.000	-.019	.013
	Second Posttest	-.006	.005	.788	-.019	.007
Second Posttest	Baseline	.003	.007	1.000	-.013	.019
	First Posttest	.006	.005	.788	-.007	.019

Based on estimated marginal means.
a. Adjustment for multiple comparisons: Bonferroni.
b. Data shown is for logarithmic transformed flourishing at work.

Next, multiple comparisons were reviewed for differences between groups. As displayed in Table 33, the pairwise comparisons confirmed that, as presumed, there were no significant findings for flourishing at work between groups.

Table 33

Pairwise Comparisons for Group for Flourishing at Work[b]

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval for Difference[a] Lower Bound	Upper Bound
A	B	.005	.045	1.000	-.115	.126
	C	.011	.050	1.000	-.123	.144
	D	-.039	.046	1.000	-.163	.084
B	A	-.005	.045	1.000	-.126	.115
	C	.005	.048	1.000	-.122	.133
	D	-.045	.044	1.000	-.161	.072
C	A	-.011	.050	1.000	-.144	.123
	B	-.005	.048	1.000	-.133	.122
	D	-.050	.049	1.000	-.180	.080
D	A	.039	.046	1.000	-.084	.163
	B	.045	.044	1.000	-.072	.161
	C	.050	.049	1.000	-.080	.180

Note. Group A represents the placebo-control group, Group B represents the top strengths group, Group C represents the bottom strengths group, and Group D represents the combination of top and bottom strengths group.
Based on estimated marginal means.
a. Adjustment for multiple comparisons: Bonferroni.
b. Data shown is for logarithmic transformed flourishing at work.

Summary of Hypothesis Testing

A series of two-way mixed ANOVAs demonstrated that there was no significant interaction effect between time and group for each of the transformed dependent variables: strengths use, job performance, and flourishing at work. Additionally, there were no significant main effects for time or group for strengths use and flourishing. Therefore, there were no significant ad hoc pairwise comparisons. Job performance showed a significant main effect for time but not for group. There were no significant ad hoc comparisons for group. However, ad hoc analysis revealed that there was a significant increase in mean scores for job performance between the baseline and first posttest measure (p = .007). Consequently, as displayed in Table

34, there was failure to reject the null hypotheses for all but one research question for one variable (i.e., the significant main effect of time for job performance).

Table 34

Summary of Research Questions, Hypotheses, and Outcomes

Research Question/Hypothesis	Dependent Variable[a]	Significance	Outcome
RQ1: Is there a statistically significant interaction effect between group and time for levels of the dependent variables?	Strengths use	$p = .325$	Fail to reject null
H_0: There is no statistically significant interaction effect between group and time.	Job performance	$p = .255$	Fail to reject null
H_1: There is a statistically significant interaction effect between group and time.	Flourishing at work	$p = .932$	Fail to reject null
RQ2: Is there a statistically significant difference between time points for levels of the dependent variables?	Strengths use	$p = .791$	Fail to reject null
H_0: There is no statistically significant difference between time points.	Job performance	$p = .013$	Null rejected
H_1: There is a statistically significant difference between time points.	Flourishing at work	$p = .620$	Fail to reject null
RQ3: Is there a statistically significant difference between groups for levels of the dependent variables?	Strengths use	$p = .577$	Fail to reject null
H_0: There is no statistically significant difference between groups.	Job performance	$p = .112$	Fail to reject null
H_1: There is a statistically significant difference between groups.	Flourishing at work	$p = .684$	Fail to reject null

a. Transformed data used for all variables.

Post Hoc Analysis

The findings from the hypothesis testing were unexpected, as discussed in detail in Chapter 5. Therefore, a post hoc analysis was performed to evaluate if different levels of strengths use impacted the outcomes for job performance and flourishing at work. As evidenced

in the hypothesis testing, the mean scores for all three variables increased for most groups between the baseline and the first posttest, and then declined modestly at the second posttest. Although these changes were mostly not significant, they suggested there was at least some positive impact from the 2-week intervention that was captured in the first posttest measure, taken immediately following the intervention. Consequently, a post hoc analysis approach taken by Dubreuil et al. (2016) was adopted to better comprehend the impact of the strengths intervention. The study by Dubreuil and colleagues had some similar nonsignificant findings for a character strengths intervention, so their post hoc approach was deemed relevant and appropriate for the current investigation.

The post hoc analysis was performed in several steps. First, the difference between baseline and first posttest strengths use was calculated. The results were then converted to standardized *z* scores, and three groups were generated from this new variable. Group 1 was comprised of participants who had *z* scores of less than -.5 (n = 40), indicating their strengths use declined from baseline to first posttest (M = -0.52, SD = 0.26). Group 2 included participants with *z* scores ranging from -.5 to .5 (n = 75), suggesting their change in strengths use was minimal or average (M = 0.04, SD = 0.16). Finally, Group 3 was defined as participants with *z* scores above .5 (n = 33), indicating their strengths use increased from baseline to first posttest (M = 0.73, SD = 0.45).

The following research questions and hypotheses were used to guide the post hoc analysis.

RQ1: Is there a statistically significant interaction effect between strengths group and time for levels of job performance and flourishing at work?

H_0: There is no statistically significant interaction effect between strengths group and time for levels of job performance and flourishing at work.

H_1: There is a statistically significant interaction effect between strengths group and time for levels of job performance and flourishing at work.

RQ2: Is there a statistically significant difference between time points (baseline and first posttest) for levels of job performance and flourishing at work?

H_0: There is no statistically significant difference between time points (baseline and first posttest) for levels of job performance and flourishing at work.

H_1: There is a statistically significant difference between time points (baseline and first posttest) for levels of job performance and flourishing at work.

RQ3: Is there a statistically significant difference between strengths groups for levels of job performance and flourishing at work?

H_0: There is no statistically significant difference between strengths groups for levels of job performance and flourishing at work.

H_1: There is a statistically significant difference between strengths groups for levels of job performance and flourishing at work.

Two-way mixed ANOVAs were conducted for job performance and flourishing at work to address the post hoc research questions and hypotheses. The three strengths groups were the independent between-subjects factor and the two time points (i.e., baseline and first posttest) were the independent within-subjects factor. Consistent with the hypothesis testing, the transformed data for each dependent variable was used for analysis.

Job Performance Post Hoc Results

First, tests of within-subjects were examined for a significant interaction between time and group. As shown in Table 35, there was a statistically significant interaction between strengths group and time for job performance, $F(2, 145) = 4.49$, $p = .013$, partial $\eta 2 = .058$, and observed power of .761. Thus, for the first post hoc research question, the null hypothesis was rejected because there was a statistically significant interaction effect between strengths group and time for levels of job performance.

Table 35

Tests of Within-Subjects Effects for Job Performance[b] (Post Hoc)

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.060	1	.060	8.367	.004	.055	.819
	Greenhouse-Geisser	.060	1	.060	8.367	.004	.055	.819
	Huynh-Feldt	.060	1	.060	8.367	.004	.055	.819
	Lower-Bound	.060	1	.060	8.367	.004	.055	.819
Time*Group	Sphericity Assumed	.064	2	.032	4.49	.013	.058	.761
	Greenhouse-Geisser	.064	2	.032	4.49	.013	.058	.761
	Huynh-Feldt	.064	2	.032	4.49	.013	.058	.761
	Lower-Bound	.064	2	.032	4.49	.013	.058	.761
Error(Time)	Sphericity Assumed	1.037	145	0.007				
	Greenhouse-Geisser	1.037	145	0.007				
	Huynh-Feldt	1.037	145	0.007				
	Lower-Bound	1.037	145	0.007				

a. Computed using alpha = .05.
b. Data shown is for the inverse transformation of job performance.

When a significant interaction is detected, the next step is to examine the simple main effects for the between-subjects and within-subjects factors (Verma, 2016). The simple main effect of time is tested by running separate repeated-measures ANOVAs for each between-subjects factor (Laerd Statistics, n.d.-c). Therefore, the data file was split by strengths groups,

and the three repeated-measures ANOVAs were performed. Table 36 shows the results for Group 1. There was no statistically significant effect of time on job performance for Group 1, $F(1, 39) = .63$, $p = .434$, partial $\eta 2 = .016$, and observed power of .120.

Table 36

Tests of Within-Subjects Effects for Job Performance[b] for Strengths Group 1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.005	1	.005	.625	.434	.016	.120
	Greenhouse-Geisser	.005	1.000	.005	.625	.434	.016	.120
	Huynh-Feldt	.005	1.000	.005	.625	.434	.016	.120
	Lower-Bound	.005	1.000	.005	.625	.434	.016	.120
Error(Time)	Sphericity Assumed	.283	39	.007				
	Greenhouse-Geisser	.283	39.000	.007				
	Huynh-Feldt	.283	39.000	.007				
	Lower-Bound	.283	39.000	.007				

a. Computed using alpha = .05.
b. Data shown is for the inverse transformation of job performance.

Table 37 shows the results for Group 2. There was a statistically significant effect of time on job performance for Group 2, $F(1, 74) = 14.10$, $p < .001$, partial $\eta 2 = .160$, and observed power of .960.

Table 37

Tests of Within-Subjects Effects for Job Performance[b] for Strengths Group 2

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.074	1	.074	14.099	.000	.160	.960
	Greenhouse-Geisser	.074	1.000	.074	14.099	.000	.160	.960
	Huynh-Feldt	.074	1.000	.074	14.099	.000	.160	.960
	Lower-Bound	.074	1.000	.074	14.099	.000	.160	.960
Error(Time)	Sphericity Assumed	.391	74	.005				
	Greenhouse-Geisser	.391	74.000	.005				
	Huynh-Feldt	.391	74.000	.005				
	Lower-Bound	.391	74.000	.005				

a. Computed using alpha = .05.
b. Data shown is for the inverse transformation of job performance.

Table 38 displays the results for Group 3. There was a statistically significant effect of time on job performance for Group 3, $F(1, 32) = 5.44$, $p = .026$, partial $\eta 2 = .145$, and observed power of .618.

Table 38

Tests of Within-Subjects Effects for Job Performance[b] for Strengths Group 3

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.062	1	.062	5.436	.026	.145	.618
	Greenhouse-Geisser	.062	1.000	.062	5.436	.026	.145	.618
	Huynh-Feldt	.062	1.000	.062	5.436	.026	.145	.618
	Lower-Bound	.062	1.000	.062	5.436	.026	.145	.618
Error(Time)	Sphericity Assumed	.363	32	.011				
	Greenhouse-Geisser	.363	32.000	.011				
	Huynh-Feldt	.363	32.000	.011				
	Lower-Bound	.363	32.000	.011				

a. Computed using alpha = .05.
b. Data shown is for the inverse transformation of job performance.

Thus, for the second post hoc research question, there was failure to reject the null hypothesis for Group 1 because job performance was not statistically significantly different between baseline and first posttest. However, the null hypothesis was rejected for Groups 2 and 3, which demonstrated statistically significant differences at postintervention compared to preintervention.

The simple main effect for the group factor is tested by performing a one-way ANOVA for each category of the within-subjects factor of time (Laerd Statistics, n.d.-c). The results for baseline job performance are displayed in Table 39. There was no significant simple main effect of strengths group for baseline performance, $F(2, 145) = .84$, $p = .435$, partial $\eta 2 = .011$, and observed power of .192.

Table 39

Tests of Between-Subjects Effects for Baseline Job Performance[c] (Post Hoc)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[b]
Corrected Model	.057[a]	2	.029	.838	.435	.011	.192
Intercept	89.666	1	89.666	2615.909	.000	.947	1.000
Strengths Groups	.057	2	.029	.838	.435	.011	.192
Error	4.97	145	.034				
Total	105.987	148					
Corrected Total	5.028	147					

a. R Squared = .011 (Adjusted R Squared = .002)
b. Computed using alpha = .05.
c. Data shown is for the inverse transformation of job performance.

The results for first posttest job performance are shown in Table 40. There was no significant simple main effect of strengths group for first posttest performance, $F(2, 145) = .21$, $p = .810$, partial $\eta 2 = .003$, and observed power of .082. Thus, in answer to the third post hoc

research question, there was no statistically significant difference in baseline or first posttest job performance between strengths groups.

Table 40

Tests of Between-Subjects Effects for First Posttest Job Performance[c]

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[b]
Corrected Model	.014[a]	2	.007	.211	.810	.003	.082
Intercept	96.337	1	96.337	2858.805	.000	.952	1.000
Strengths Groups	.014	2	.007	.211	.810	.003	.082
Error	4.886	145	.034				
Total	113.87	148					
Corrected Total	4.901	147					

a. R Squared = .003 (Adjusted R Squared = .011)
b. Computed using alpha = .05.
c. Data shown is for the inverse transformation of job performance.

The estimated marginal means were reviewed and reported as back-transformed data for meaningful analysis, as displayed in Table 41. The mean scores for Group 1 ranged from *M* = 4.78, *SE* = .06, 95% CI [4.67, 4.89] at baseline to *M* = 4.74, *SE* = .06, 95% CI [4.62, 4.85] at first posttest. Group 2 scores ranged from *M* = 4.69, *SE* = .04, 95% CI [4.61, 4.77] at baseline to *M* = 4.76, *SE* = .04, 95% CI [4.67, 4.85] at first posttest. Group 3 mean scores ranged from *M* = 4.68, *SE* = .06, 95% CI [4.55, 4.80] at baseline to *M* = 4.79, *SE* = .07, 95% CI [4.66, 4.92] at first posttest.

Table 41

Estimated Marginal Means for Job Performance[a] by Time and Strengths Group

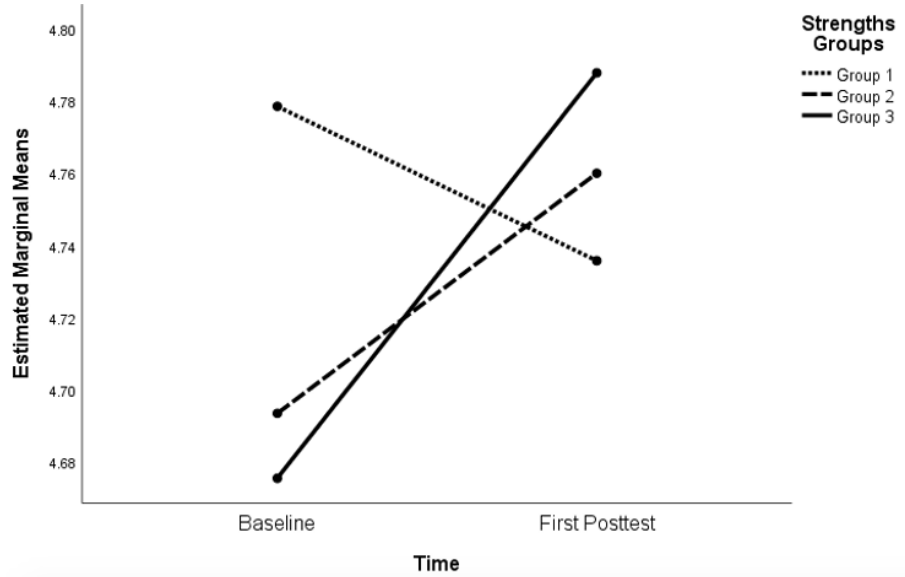
				95% Confidence Interval	
Group	Time	Mean	Std. Error	Lower Bound	Upper Bound
1	Baseline	4.779	.056	4.668	4.889
	First Posttest	4.736	.060	4.617	4.854
2	Baseline	4.693	.041	4.612	4.774
	First Posttest	4.760	.044	4.673	4.847
3	Baseline	4.675	.062	4.553	4.797
	First Posttest	4.788	.066	4.657	4.918

Note. Group 1 represents a decrease in strengths use from baseline to first posttest, Group 2 represents a marginal or average change in strengths use from baseline to first posttest, Group 3 represents an increase in strengths use from baseline to first posttest.
a. Data shown is for back-transformed job performance.

Figure 17 shows the estimated marginal means plotted in a line chart. Group 1 demonstrated a drop in job performance from baseline to first posttest, albeit not significant as noted above. However, Groups 2 and 3 demonstrated an increase in job performance from preintervention to postintervention, which was significant, as indicated above.

Figure 17

Estimated Marginal Means Plot for Job Performance[a] by Time and Strengths Group



Note. Group 1 represents a decrease in strengths use from baseline to first posttest, Group 2 represents a marginal or average change in strengths use from baseline to first posttest, Group 3 represents an increase in strengths use from baseline to first posttest.
a. Data shown is for back-transformed job performance.

Flourishing at Work Post Hoc Results

Tests of within-subjects were evaluated for a significant interaction between time and group. As shown in Table 42, there was no statistically significant interaction between the group and time for flourishing at work, $F(2, 145) = 2.55$, $p = .082$, partial $\eta 2 = .034$, and observed power of .503. Therefore, for the first post hoc research question, there was failure to reject the null hypothesis because there was no statistically significant interaction effect between strengths group and time for levels of flourishing. Subsequently, main effects for the between-subjects and within-subjects factors were examined (Verma, 2016). As also displayed in Table 42, the main effect of time did not show a statistically significant difference in mean flourishing at work at the different time points, $F(1, 145) = .24$, $p = .626$, partial $\eta 2 = .002$, and observed power of .077. Consequently, for the second post hoc research question, there was failure to reject the null

hypothesis because there was no statistically significant difference between the baseline and first posttest for levels of flourishing at work.

Table 42

Tests of Within-Subjects Effects for Flourishing at Work[b] (Post Hoc)

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Time	Sphericity Assumed	.001	1	.001	.239	.626	.002	.077
	Greenhouse-Geisser	.001	1.000	.001	.239	.626	.002	.077
	Huynh-Feldt	.001	1.000	.001	.239	.626	.002	.077
	Lower-Bound	.001	1.000	.001	.239	.626	.002	.077
Time*Group	Sphericity Assumed	.015	2	.008	2.548	.082	.034	.503
	Greenhouse-Geisser	.015	2.000	.008	2.548	.082	.034	.503
	Huynh-Feldt	.015	2.000	.008	2.548	.082	.034	.503
	Lower-Bound	.015	2.000	.008	2.548	.082	.034	.503
Error(Time)	Sphericity Assumed	.435	145	.003				
	Greenhouse-Geisser	.435	145.000	.003				
	Huynh-Feldt	.435	145.000	.003				
	Lower-Bound	.435	145.000	.003				

a. Computed using alpha = .05.
b. Data shown is for the logarithmic transformation of flourishing at work.

Next, the main effect of group was examined, as displayed in Table 43. The main effect of group indicated there was a statistically significant difference in mean flourishing at work between strengths groups $F(2, 145) = 4.45$, $p = .013$, partial $\eta 2 = .058$, and observed power of .756. As such, for the third post hoc research question, the null hypothesis was rejected because there was a statistically significant difference in the levels of flourishing at work across strengths groups.

Table 43

Tests of Between-Subjects Effects for Flourishing at Work[b] (Post Hoc)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Observed Power[a]
Intercept	79.293	1	79.293	1012.97	.000	.875	1.000
Strengths Group	.696	2	.348	4.447	.013	.058	.756
Error	11.35	145	.078				

a. Computed using alpha = .05.
b. Data shown is for the logarithmic transformation of flourishing at work.

The significant result for the main effects of the group factor meant that pairwise comparisons were consulted. The results displayed in Table 44 indicated that Group 2 mean scores for flourishing at work were significantly different than those for Group 3 (p = .037), regardless of time. There was no significant result between Groups 1 and 2 (p = .067) or between Groups 1 and 3 (p = 1.000).

Table 44

Pairwise Comparisons for Strengths Group for Flourishing at Work[c]

(I) Strengths Group	(J) Strengths Group	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
1	2	.089	.039	.067	-.004	.183
	3	-.015	.047	1.000	-.128	.097
2	1	-.089	.039	.067	-.183	.004
	3	-.105*	.041	.037	-.205	-.005
3	1	.015	.047	1.000	-.097	.128
	2	.105*	.041	.037	.005	.205

Note. Group 1 represents a decrease in strengths use from baseline to first posttest, Group 2 represents a marginal or average change in strengths use from baseline to first posttest, Group 3 represents an increase in strengths use from baseline to first posttest.
Based on estimated marginal means.
a*. The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni.
c. Data shown is for logarithmic transformed flourishing at work.

The estimated marginal means for flourishing at work were reviewed. For this step, the data were back-transformed for meaningful analysis. Table 45 displays the estimated marginal means for each strengths group across time periods. The mean scores for Group 1 ranged from *M* = 6.92, *SE* = .28, 95% CI [6.37, 7.47] at baseline to *M* = 6.78, *SE* = .28, 95% CI [6.22, 7.34] at first posttest. Group 2 scores ranged from *M* = 7.49, *SE* = .20, 95% CI [7.08, 7.89] at baseline to *M* = 7.50, *SE* = .21, 95% CI [7.09, 7.90] at first posttest. Group 3 mean scores were *M* = 6.29, *SE* = .31, 95% CI [5.68, 6.89] at baseline and *M* = 6.54, *SE* = .31, 95% CI [5.92, 7.15] at first posttest.

Table 45

Estimated Marginal Means for Flourishing at Work[a] by Time and Strengths Group

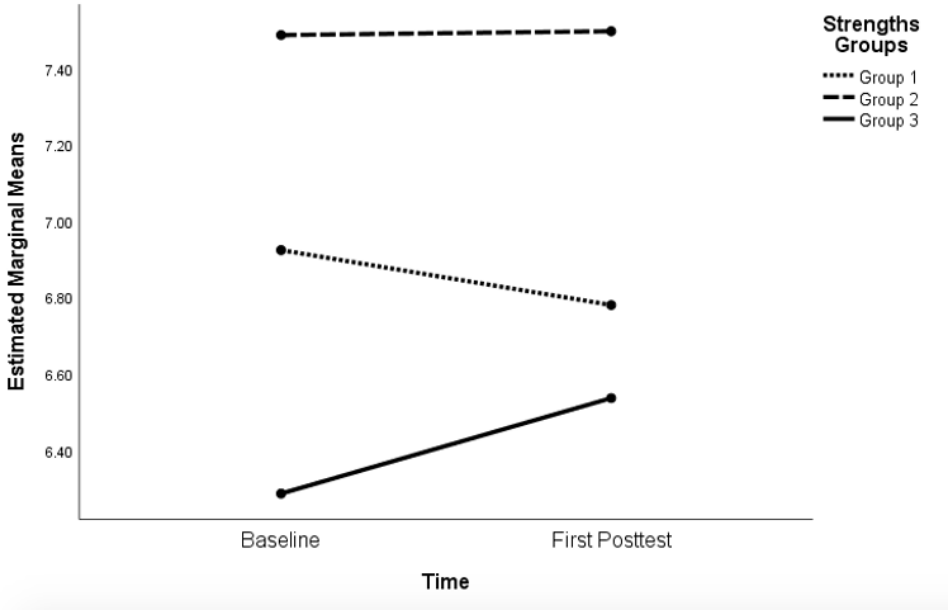
				95% Confidence Interval	
Group	Time	Mean	Std. Error	Lower Bound	Upper Bound
1	Baseline	6.923	.279	6.373	7.474
	First Posttest	6.780	.281	6.224	7.335
2	Baseline	7.487	.204	7.084	7.889
	First Posttest	7.497	.205	7.091	7.902
3	Baseline	6.286	.307	5.679	6.892
	First Posttest	6.536	.310	5.924	7.148

Note. Group 1 represents a decrease in strengths use from baseline to first posttest, Group 2 represents a marginal or average change in strengths use from baseline to first posttest, Group 3 represents an increase in strengths use from baseline to first posttest.
a. Data shown is for back-transformed flourishing at work.

Figure 18 shows the estimated marginal means plotted in a line chart. The significant difference found between Groups 2 and 3 is evident in this graphical form, with Group 2 demonstrating higher mean scores for flourishing at work than Group 3 at both time points.

Figure 18

Estimated Marginal Means Plot for Flourishing at Work[a] by Time and Strengths Group



Note. Group 1 represents a decrease in strengths use from baseline to first posttest, Group 2 represents a marginal or average change in strengths use from baseline to first posttest, Group 3 represents an increase in strengths use from baseline to first posttest.
a. Data shown is for back-transformed flourishing at work.

Summary of Post Hoc Analysis

The data were grouped by standardized *z* scores of the change in strengths use from baseline to first posttest. Group 1 demonstrated a decline in strengths use from preintervention to postintervention, Group 2 showed minimal or average change from baseline to first posttest, and Group 3 showed an increase in strengths use from baseline to first posttest. These strengths groups served as a new between-subjects factor in a couple of two-way mixed ANOVAs that were performed for job performance and flourishing at work. There was a significant interaction effect between time and strengths group for job performance. Additionally, there were significant findings for the simple main effect of time for Groups 2 and 3, but not for Group 1. There was no significant finding for the simple main effect of group for job performance.

There was no significant interaction effect between time and strengths group for flourishing at work. Moreover, there was no significant result for the main effect of time. However, there was a significant finding for the main effect of group. Pairwise comparisons revealed that the significant difference was between Groups 2 and 3. Therefore, as displayed in Table 46, there was a mix of outcomes with only some post hoc null hypotheses rejected.

Table 46

Summary of Research Questions, Hypotheses, and Outcomes for Post Hoc Analysis

Research Question/Hypothesis	Dependent Variable[a]	Significance	Outcome
RQ1: Is there a statistically significant interaction effect between strengths group and time for job performance and flourishing?	Job performance	$p = .013$	Null rejected
H_0: There is no statistically significant interaction effect between group and time.	Flourishing at work	$p = .082$	Fail to reject null
H_1: There is a statistically significant interaction effect between group and time.			
RQ2: Is there a statistically significant difference between baseline and first posttest for job performance and flourishing?	Job performance (1)	$p = .434$	Fail to reject null
	Job performance (2)	$p < .001$	Null rejected
	Job performance (3)	$p = .026$	Null rejected
H_0: There is no statistically significant difference between time points.			
H_1: There is a statistically significant difference between time points	Flourishing at work	$p = .626$	Fail to reject null
RQ3: Is there a statistically significant difference between strengths groups for levels of job performance and flourishing?	Job performance	$p = .435$	Fail to reject null
		$p = .810$	Fail to reject null
H_0: There is no statistically significant difference between strengths groups.	Flourishing at work	$p = .013$	Null rejected
H_1: There is a statistically significant difference between strengths groups.			

Note. Numbers displayed in parentheses represent the corresponding strengths groups. Group 1 represents a decrease in strengths use from baseline to first posttest, Group 2 represents a marginal or average change in strengths use from baseline to first posttest, Group 3 represents an increase in strengths use from baseline to first posttest.
a. Transformed data used for all variables.

Summary

A series of two-way mixed ANOVAs were performed to evaluate if different 2-week strengths interventions had a significant impact on strengths use, job performance, and

flourishing at work among full-time employees ages 18-65. The between-subjects factor was the groups, with four levels (i.e., one placebo-control group and three strengths intervention groups). Group A was the placebo-control group, Group B used top strengths at work, Group C used bottom strengths at work, and Group D used a combination of top and bottom strengths at work. The within-subjects factor was time, with three levels: (a) baseline, which was preintervention, (b) first posttest, measured immediately after the 2-week intervention, (c) second posttest, captured 4 weeks after the intervention.

An evaluation of the dependent variables across all cells of the study revealed there were violations of assumptions for a two-way mixed ANOVA. Therefore, transformations were used to normalize the data. A logarithmic transformation was used for strengths use and flourishing at work. An inverse transformation was used for job performance. The transformed data met most of the required assumptions for a two-way mixed ANOVA.

Findings from the inferential tests showed there was no significant interaction effect between group and time for any of the dependent variables. Additionally, there were no significant findings for the main effects of time and group. The only exception was a significant result for job performance for the main effect of time [$F(2, 288) = 4.42$, $p = .013$, partial $\eta 2 = .030$, observed power = .758]. Ad hoc pairwise comparisons revealed that the difference in job performance mean scores was a significant increase from the baseline to first posttest ($p = .007$).

Post hoc analysis was performed by creating three new groups based on participants' change in strengths use scores from baseline to first posttest. Three groups were created using standardized *z* scores: (a) Group 1 declined in strengths use, (b) Group 2 displayed minimal or average change in strengths use, and (c) Group C increased in strengths use. Another set of two-way mixed ANOVAs were performed for job performance and flourishing at work, this time

using the new strengths groups as the between-subjects factor. There was a significant interaction effect between time and group for job performance [$F(2, 145) = 4.49$, $p = .013$, partial $\eta 2 = .058$, observed power = .761]. Additionally, there was a significant finding for the simple main effect of time for Group 2 [$F(1, 74) = 14.10$, $p < .001$, partial $\eta 2 = .160$, observed power = .960] and Group 3 [$F(1, 32) = 5.44$, $p = .026$, partial $\eta 2 = .145$, observed power = .618], with both groups showing a statistically significant increase in job performance from baseline to first posttest. There was no significant finding for the simple main effect of group for job performance.

There was no significant interaction effect between time and group for flourishing at work. Additionally, there was no significant finding for the main effect of time. However, there was a significant result for the main effect of group [$F(2, 145) = 4.45$, $p = .013$, partial $\eta 2 = .058$, observed power = .756]. Pairwise comparisons revealed there was a significant difference in mean scores for flourishing at work between Groups 2 and 3 ($p = .037$). Chapter 5 provides a detailed discussion and interpretation of the study results, and a review of the limitations, implications for practice, and recommendations for further research.

CHAPTER 5. DISCUSSION, IMPLICATIONS, RECOMMENDATIONS

The present quantitative study examined the impact of different character strengths interventions on the dependent variables of strengths use, job performance, and flourishing at work. This chapter provides a summary, discussion, and interpretation of the study results. Additionally, conclusions based on the results are discussed in relation to the study's theoretical framework and previous literature. Limitations are reviewed along with implications for practice. Lastly, future recommendations are offered, followed by the study's conclusion.

Summary of the Results

This study strived to address the research problem of whether character strengths interventions are effective in improving strengths use, job performance, and flourishing at work for full-time employees, ages 18-65. Specifically, whether there was any difference in interventions focusing on the use of top strengths versus bottom strengths, or a combination of top and bottom strengths. The study topic was significant for I/O psychology because the findings could inform intervention application in the workplace, and SIOP (2021b) has placed considerable focus on understanding and improving employee well-being and engagement in recent years. Additionally, the topic was an important investigation for positive psychology because it could help advance knowledge of character strengths as a central positive psychology construct (Peterson & Seligman, 2004).

The guiding theoretical framework for the study was the broaden-and-build theory (Fredrickson, 1998, 2001), which states that, unlike negative emotions that narrow an individual's thought-action response, positive emotions broaden in-the-moment cognitive-action resources, and repetition of these experiences builds an individual's physical, mental, and interpersonal resources over time. The theory served to guide predictions for the study. For

instance, character strengths have been described as a pathway to flourishing (Seligman, 2011). Additionally, performance may be related to character strengths per the happy/productive worker concept (Lyubomirsky, King, & Diener, 2005; Staw, 1986; Wright & Staw, 1999). Moreover, positive affect has been identified as a mediator between strengths use and favorable work-related outcomes (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017; Meyers & van Woerkom, 2017; Quinlan et al., 2012; van Woerkom & Meyers, 2015). Thus, the broaden-and-build theory offered a helpful framework for predicting and potentially explaining the study results.

The literature review conducted for this study indicated that character strengths were positively correlated with a range of desirable work-related variables, such as productivity, OCB, job satisfaction (Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010), and performance (Littman-Ovadia et al., 2017). Moreover, some character strengths interventions in the workplace have yielded encouraging results, including enhanced employee work engagement and job performance (Peláez et al., 2020), positive affect, psychological capital (Meyers & van Woerkom, 2017), life satisfaction, and perceiving work as a calling (Harzer & Ruch, 2016). Still, no published studies have examined the impact of using top versus bottom strengths in the organizational context. Therefore, the present study sought to contribute to the literature by examining this underexplored topic.

The present study was an experimental, longitudinal investigation testing the impact of different 2-week character strengths interventions. There were two independent variables. The first independent variable was time (within-subjects), with three levels: baseline, first posttest (immediately after the intervention), and second posttest (4 weeks after the intervention). The second independent variable was group (between-subjects), with four levels: one placebo-control

group and three strengths intervention groups. The placebo-control group was asked to journal on childhood memories. The first intervention group was asked to use top strengths at work, the second group was asked to use their bottom strengths at work, and the third group was asked to use both top and bottom strengths at work over the 2-week intervention. There were three dependent variables: strengths use, job performance, and flourishing at work. The data were transformed for analysis, though the assumption of sphericity was still violated for flourishing at work, and the assumption of homogeneity of variances and covariances was still violated for job performance. Additionally, all cells of the job performance data violated the Shapiro-Wilk's test. However, all skewness and kurtosis scores were within the acceptable range of ± 2, indicating normality. Thus, the data were not perfect and results should be interpreted with this in mind.

A series of two-way mixed ANOVAs were conducted, one for each dependent variable. Results from the two-way mixed ANOVAs showed there was no significant interaction of time and group for any of the dependent variables. Additionally, there were no significant findings for the main effect of time or the main effect of group for strengths use and flourishing. Finally, there was no significant result for the main effect of group for job performance, but there was a significant finding with a medium effect size for the main effect of time ($p = .013$, partial $\eta 2 = .030$). Ad hoc pairwise comparisons indicated there was a significant increase in mean scores for job performance from the baseline to posttest measures ($p = .007$).

Post hoc analyses were performed to evaluate if participants' change in strengths use between the baseline and first posttest impacted outcomes for job performance and flourishing at work before and immediately after the intervention. The data were reorganized into three groups using standardized *z* scores for the change in strengths use from baseline to first posttest. Group 1's strengths use declined from baseline to first posttest, Group 2's strengths use change was

minimal or average, and Group 3 increased in strengths use from preintervention to postintervention. Two-way mixed ANOVAs showed a significant interaction with a medium effect size between time and group for job performance (p = .013, partial η2 = .058). Additionally, there were significant results with a large effect size for the simple main effect of time for Group 2 (p < .001, partial η2 = .160) and Group 3 (p = .026, partial η2 = .145). There was no significant interaction between time and group, and no significant finding for the main effect of time for flourishing at work. However, there was a significant result with a medium effect size for the main effect of group (p = .013, partial η2 = .058). Pairwise comparisons indicated that Group 2 mean scores for flourishing at work were significantly higher than those for Group 3 (p = .037), regardless of time. Discussion and interpretation of the results are provided in the following sections.

Discussion of the Results

The study results were somewhat surprising. The present study addressed the overall research question, do character strengths interventions impact strengths use, job performance, and flourishing at work for full-time employees, ages 18-65? Three research questions were used to answer the question, all of which were expected to have significant findings.

RQ1: Is there a statistically significant interaction effect between group and time for levels of strengths use, job performance, and flourishing at work?

RQ2: Is there a statistically significant difference between time points for levels of strengths use, job performance, and flourishing at work?

RQ3: Is there a statistically significant difference between groups for levels of strengths use, job performance, and flourishing at work?

Instead, there was failure to reject the null hypothesis for all research questions and all variables, except for the second research question for job performance. Taken at face value, these results suggested that none of the strengths interventions were particularly effective in increasing strengths use, job performance, or flourishing at work. Moreover, they were no more effective than a placebo activity of journaling on childhood memories. These findings seemed to contradict the previous research, which has supported significant positive relationships between character strengths and desirable work-related outcomes (e.g., Harzer & Ruch, 2016; Lavy & Littman-Ovadia, 2017; Littman-Ovadia & Davidovitch, 2010; Meyers & van Woerkom, 2017; Peláez et al., 2020).

However, this study was not an anomaly because other character strengths intervention research has yielded somewhat similar results. A study by Dubreuil et al. (2016) found that employees reported significantly greater strengths use and levels of well-being following a character strengths intervention. Still, their results also showed no significant difference on several other variables, including work performance, harmonious passion, vitality, and concentration. Therefore, there is evidence that some character strengths interventions have not yielded significant findings. Conclusions from the present study will be discussed in the context of prior research in greater detail in the next section.

In seeking to understand the current study's results, it is important to consider various elements of the study design that could have impacted the results. For instance, the intervention might not have been long enough. Indeed, the present study's intervention was only 2 weeks in length. Although some strengths interventions have been effective over shorter periods (e.g., Seligman et al., 2005), others conducted in the workplace have been lengthier, spanning 4 weeks (Harzer & Ruch, 2016), 5 weeks (Peláez et al., 2020), and 8 weeks (Pang & Ruch, 2019).

Additionally, there might not have been enough context about strengths use for participants in the current study, which provided only a 15-min introductory video at the outset of the intervention and basic instructions and examples for each week of the intervention. Although some strengths interventions used a similar approach and yielded significant results (e.g., Proyer et al., 2015; Seligman et al., 2005), others have included a good deal more support. For example, participants engaged in a strengths intervention that included workshop sessions and one-on-one coaching in a study by Peláez and colleagues (2020). Similarly, participants experienced eight 2-hour in-person workshops in the study conducted by Pang and Ruch (2019). Consequently, the length of the intervention and the level of support provided in the present study might have impacted the effectiveness of the interventions.

Moreover, Dubreuil et al. (2016) noted that applying strengths in an organizational context requires an investment of time and effort from participants, which might not have been present in the current study. Participants were full-time employees who also conduct human intelligence tasks (HITs) on the MTurk (Amazon Mechanical Turk, 2018) platform, presumably in their spare time. Therefore, these participants had not previously expressed an interest in character strengths and might not have been as focused on the intervention activities as participants recruited from a specific organization.

Finally, the effectiveness of the intervention might have been impacted by its method of administration. Namely, that it was conducted online instead of in-person. For example, a meta-analysis of 37 studies and 42 samples for workplace resilience interventions found that one-on-one coaching produced the most effective results, followed by in-person group sessions, while online or computer-based interventions were the least effective (Vanhove, 2016). Still, some character strengths interventions have been conducted online and were effective in achieving

their goals (e.g., Harzer & Ruch, 2016; Proyer et al., 2015). In summary, there were several limitations to the present study that could have affected the results. These are discussed in greater detail in the Limitation section later in this chapter.

Conclusion Based on the Results

The present study did not offer conclusive results. Other than a significant increase in job performance following the intervention, it failed to confirm previous findings that character strengths interventions can lead to desirable work-related outcomes (Harzer & Ruch, 2016; Meyers & van Woerkom, 2017; Pang & Ruch, 2019; Peláez et al., 2020). However, similar nonsignificant results have been observed in prior research (Dubreuil et al., 2016), and the present study still offered directional insights that can inform future research. This section provides a discussion of the study conclusions with respect to the theoretical framework and previous literature, and an interpretation of the findings that reviews possible explanations for the study's outcome.

Comparison of the Findings with the Theoretical Framework and Previous Literature

As discussed in the Chapter 2 literature review, there is evidence that becoming aware of and using character strengths leads to positive outcomes in the workplace (e.g., Harzer & Ruch, 2012, 2013, 2014, 2015). Furthermore, several workplace-focused character strengths interventions have demonstrated effectiveness, including increased work engagement and job performance (Peláez et al., 2020), employee positive affect, psychological capital (Meyers & van Woerkom, 2017), life satisfaction, and perceiving work as a calling (Harzer & Ruch, 2016). Still, since the development of character strengths over 15 years ago, there have been relatively few character strengths intervention studies, and much remains unknown (Ruch et al., 2020).

Indeed, the current study sought to understand better the impact of using top versus bottom character strengths because only a couple of published studies had addressed this question, both of which were conducted in a nonorganizational context. Rust et al. (2009) found no significant difference in life satisfaction among students who focused on using top strengths compared to those who used both top and bottom strengths. Similarly, in a general population study, Proyer et al. (2015) showed significant increases in happiness and decreases in depressive symptoms for up to 3 months in a group assigned to use top strengths and another group assigned to use bottom strengths. Taken together, these studies suggested that it could be beneficial to use both top and bottom strengths.

Additionally, other research supported the idea that deficit improvement could lead to desirable outcomes, such as increased work performance (Abdullah et al., 2009; Anguinis & Kraiger, 2009), more job satisfaction (Lee & Bruvold, 2003), and improved work engagement (Salas et al., 2012). Still, strengths proponents have long argued that a deficit-based approach has limited benefit because it is more challenging and somewhat deflating for individuals to spend time working on what they are not good at (Buckingham & Clifton, 2001; Peterson & Seligman, 2004; Rath & Conchie, 2009; Seligman, 1999). Therefore, there was disagreement in the literature, and the present study was intended to contribute to the growing body of knowledge in this topic area.

As noted above, the study yielded inconclusive results. The lack of significant differences between the intervention groups suggested there was no meaningful differentiation between using top strengths, bottom strengths, or a combination of both. Nevertheless, the directional indicators in the present study's main results are worth nothing, even if they were not significant. For example, the estimated marginal means of strengths use and flourishing (Figures 14 and 16,

respectively, in Chapter 4) showed that Group C's mean scores dropped from the baseline to first posttest before ticking back up in the second posttest. However, Group C's scores for performance changed minimally between the baseline and two posttests (Figure 15, Chapter 4).

These mean score patterns are of interest because Group C participants were asked to use their bottom strengths at work for the 2-week intervention. The dip from baseline to first posttest for strengths use and flourishing at work indicated that participants in this group might have struggled with using their bottom strengths during the intervention. This idea is consistent with the strengths-based philosophy that most people find it much easier and more natural to use their top strengths than their bottom strengths (Niemiec, 2018; Peterson & Seligman, 2004). Underscoring this interpretation, participants' strengths use and flourishing at work increased to approximately baseline levels at the second posttest, suggesting that they discarded efforts to use bottom strengths. Alternatively, they might have continued their efforts and found some equilibrium with it over time. Either way, job performance remained virtually unchanged from the baseline at both posttests, implying that using bottom strengths may not be that beneficial for employee performance.

Another pattern is evident in the study's main results. Groups A, B, and D all experienced an increase in mean scores from baseline to first posttest across the dependent variables. During the 2-week intervention, Group A engaged in the placebo-control activity of journaling on childhood memories, Group B used top strengths at work, and Group D used a top strength for 1 week and a bottom strength for the other week. It was unexpected that Group A would experience increases in the dependent variables after the intervention because their activity was not strengths-focused. These findings suggested that participants in the placebo-control group might have experienced what is referred to as the Hawthorne Effect, which is the phenomenon

that participants improve their performance because they know they are being studied (McCarney et al., 2007). Alternatively, it is possible that participants enjoyed the activity of recalling childhood memories, and they experienced more positive emotions during the 2-week intervention.

Per the broaden-and-build theory (Fredrickson, 1998, 2001) guiding the present study, positive emotions can lead to enhanced well-being (Tugade & Fredrickson, 2004; Tugade et al., 2004) and workplace success (Fredrickson, 2013). Therefore, Group A could have demonstrated improvements in strengths use, job performance, and flourishing at work because of their positive experience with the intervention. Similarly, Groups B and D, who had the opportunity to use their top strengths for 1 or 2 weeks, might also have demonstrated higher strengths use, job performance, and flourishing at work mean scores postintervention because they found the activity enjoyable. Indeed, the use of top strengths has often been found to significantly increase well-being, happiness, and life satisfaction and decrease depressive symptoms (Schutte & Malouff, 2019). Moreover, positive affect has been identified as a mediator between strengths use and favorable work-related outcomes (e.g., Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017; Meyers & van Woerkom, 2017; Quinlan et al., 2012; van Woerkom & Meyers, 2015). Thus, although most were not significant, the changes in mean scores across time and group for the main study results offer some possible insights regarding the impact of the various interventions. Additionally, these directional findings are consistent with the study's grounding literature and theoretical framework. Still, they also point to the need for further investigation to help clarify the inconclusive results.

Interpretation of the Findings

The present study's nonsignificant findings were seemingly contradictory compared to various other character strengths interventions that have yielded positive results (Harzer & Ruch, 2016; Meyers & van Woerkom, 2017; Pang & Ruch, 2019; Peláez et al., 2020). However, a study by Dubreuil and colleagues (2016) had similar results. It found that employees reported significantly greater strengths use and levels of well-being following a character strengths intervention. Yet, their results also showed no significant difference on several other variables, including work performance, harmonious passion, vitality, and concentration. Consequently, the authors conducted a post hoc analysis and found that employees who reported the greatest increase in using strengths from preintervention to postintervention demonstrated significant increases in work performance and harmonious passion.

The post hoc analysis method employed by Dubreuil et al. (2016) was used in the current study to interpret the results better, and it yielded comparable findings. Indeed, there was a significant increase in job performance for the groups with minimal change in strengths use and an increase in strengths use from baseline to first posttest. Moreover, although not significant, the group who declined in strengths use from baseline to first posttest showed a decrease in job performance mean scores from preintervention to postintervention. These post hoc findings suggested that at least some positive change in strengths use might be needed to produce an increase in job performance.

Although the post hoc analysis for the present study did not find the same significant results for flourishing at work across time and groups, a review of the estimated marginal means (Figure 18, Chapter 4) indicated a similar pattern that could connect change in strengths use with results for the other dependent variables. Specifically, the group who declined in strengths use

from baseline to posttest also declined in flourishing at work. Furthermore, there was virtually no change in flourishing at work mean scores for the group with minimal change in strengths use from baseline to first posttest. Yet, there was an increase in flourishing at work for the group who increased in strengths use from baseline to first posttest. Therefore, like the study by Dubreuil et al. (2016), the present investigation suggested that change in strengths use could impact outcomes. Namely, that strengths use alone does not lead to enhanced results. Rather, it is the extent to which strengths use increases that might lead to favorable outcomes.

In summary, although the study's main results were at odds with prior research (Harzer & Ruch, 2016; Meyers & van Woerkom, 2017; Pang & Ruch, 2019; Peláez et al., 2020), they were somewhat consistent with a study conducted by Dubreuil et al. (2016). Moreover, the post hoc analysis method used by Dubreuil and colleagues helped illuminate a possible explanation for the current study's results. Specifically, that changes in strengths use from preintervention to postintervention influenced job performance and flourishing at work, and therefore, could have impacted the effectiveness of the interventions. Of course, the study's limitations could also have affected the results, and these are discussed next.

Limitations

The present study used a longitudinal, experimental approach to examine the impact of different character strengths interventions. Although experimental is considered the "gold standard" of research methods because of its internal validity (Sternberg, 2006), various elements of the study design presented limitations. These included self-report measures, a convenience sample, sample size, the length of the intervention, its content, and how it was delivered. Additionally, there were some delimitations. Each of these issues is addressed in this section.

The dependent variables were measured by self-report questionnaires rather than observation. Although this was the most feasible way to complete the study, it may have presented issues, particularly with the In-Role Behavior Work Performance Scale (Williams & Anderson, 1991) used to measure job performance. As noted in Chapter 4, most participants rated their performance highly across all three time points, with an influential modal value of 5.0 for the one-to-five Likert scale. This scale has been used in the self-report form in prior studies with a mean score of 4.36 (Lavy & Littman-Ovadia, 2017; Littman-Ovadia et al., 2017). However, in this study, the mean score for job performance was somewhat higher, ranging from 4.56 to 4.81. Thus, job performance might be better measured by supervisor observation than by self-report.

The sample was recruited from MTurk (Amazon Mechanical Turk, 2018), and respondents were paid a monetary incentive for participation, which raises the question of whether they were truly engaged in the intervention or just trying to make some money. Moreover, participants included only those MTurk workers who had completed at least 5,000 tasks on the platform and maintained a 95% task-completion approval rating. These inclusion criteria meant that participants were classified as highly experienced MTurk workers who may have been exposed to numerous social and behavior studies (Litman & Robinson, 2021) and could be considered "professional study participants." Such experienced MTurk workers were selected for the present study to mitigate the high attrition rate often observed in longitudinal and online studies. Still, the coverage bias created by selecting this sub-group of the MTurk worker population could have affected results. Moreover, the sample was not representative of all U.S. full-time employees. Therefore, the study results cannot be generalized. Additionally, a sample

size of 148 participants was a possible limitation. It was a relatively small sample, which could have reduced statistical power for the analyses.

The intervention appears to have had several limitations. First, the 2-week period during which participants engaged in the intervention was less than in other character strengths interventions (e.g., Harzer & Ruch, 2016; Pang & Ruch, 2019; Peláez et al., 2020). Indeed, in a meta-analysis of various PPIs, Sin and Lyubomirsky (2009) found that longer-duration interventions yielded larger effect sizes. Moreover, as Harzer and Ruch (2016) noted, applying strengths at work may need substantially more time than a matter of weeks. Thus, the relatively short intervention used in the current study might not have offered enough time for participants to integrate their strengths use fully.

Second, the intervention delivered some context, simple instructions, and examples for participants to use their strengths. However, these materials might not have provided enough information and support for participants. For instance, Niemiec (2018) recommended using the aware-explore-apply model for integrating character strengths use. The aware element was incorporated in the study by having participants take the VIA survey (VIA Institute on Character, 2021a). Arguably, in using their strengths at work, participants had an opportunity to explore and apply them. However, these elements of Niemiec's model were not comprehensively addressed. Niemiec described the explore phase as a period of reflection where individuals consider their strengths and connect them to past successes and experiences. The apply phase involves setting goals and creating action plans for how to best use strengths moving forward. Neither of these more in-depth approaches to exploring and applying strengths was used in the current study.

The intervention was conducted online. While this was appropriate for the sample recruitment method and fielding a research study during the COVID-19 pandemic, it might have

been a limitation. In a meta-analysis of 18 strengths interventions, Ghielen et al. (2018) detected no significant difference between effect sizes of studies conducted online versus in-person. Still, in-person positive psychology interventions often have superior outcomes than those that are self-administered (Sin & Lyubomirsky, 2009). Additionally, other types of interventions, such as those designed to enhance employee resilience, have demonstrated greater impact when conducted in-person rather than online (Vanhove, 2016). Consequently, it is unknown if the online delivery diminished the effectiveness of the current intervention study, but it could have been a limiting factor.

Finally, there were some delimitations in this study. Like any study, the research problem was narrowly defined, which limited the scope of the investigation. Specifically, the study sought to examine to what extent using top strengths, bottom strengths, or a combination of both impacted strengths use, job performance, and flourishing at work. However, these are not the only categories of strengths that could be explored. For example, the strengths of zest, hope, love, gratitude, and curiosity are often grouped together and referred to as "happiness strengths" because of their strong correlations with life satisfaction (Buschor et al., 2013; Park et al., 2004). Similarly, different work-related outcome variables have been explored in strengths research that were not included in this study, such as OCB, job satisfaction (Lavy & Littman-Ovadia, 2017), and engagement (Littman-Ovadia et al., 2017). Thus, the study was limited in scope to investigating only specific groups of strengths and the dependent variables of strengths use, job performance, and flourishing.

In summary, there were numerous limitations to the current study. However, the study design and intervention length, content, and delivery were based on prior literature and feasibility. Indeed, the current study was conducted with substantial time and budget constraints

and with a desire to bolster participant retention. These practical factors meant that the study design was far from ideal, yet it still strived to meet scientific merit.

Implications for Practice

The current study offered important implications for practice. Indeed, the results are informative for several stakeholders, including I/O psychologists, positive psychologists, employers, and managers concerned with enhancing workplace outcomes. The findings failed to demonstrate that the 2-week strengths interventions significantly increased strengths use and flourishing at work. However, there was a significant increase in job performance from preintervention to postintervention, and all the results were instructional and provided direction for practical application.

First, there were indications that participants who used their bottom strengths at work declined in strengths use and flourishing and showed virtually no change in job performance. By contrast, participants who used their top strengths for 1 or 2 weeks of the intervention posted an increase in mean scores for all three outcome variables. Although nonsignificant, these directional findings suggest that it may be more beneficial for workers to focus on applying their top strengths, as recommended by several scholars (Buckingham & Clifton, 2001; Peterson & Seligman, 2004; Rath & Conchie, 2009; Seligman, 1999). Thus, stakeholders might observe greater gains by having workers focus on applying their top strengths.

Second, the post hoc analyses revealed that participants' change in strengths use could play a role in outcomes. Specifically, that at least a minimal increase in strengths use may be required to produce elevated levels of job performance and flourishing. Thus, stakeholders should evaluate workers' strengths use before and after implementing a strengths-based intervention. Additionally, this finding could be used to identify workers who might benefit the

most from a strengths intervention. Namely, workers who score lower on strengths use before an intervention and, therefore, have greater potential to increase their strengths use and possibly their levels of job performance or flourishing at work.

Finally, as discussed in the Limitations section, the study outcomes might have been diminished because the interventions were brief (i.e., only 2 weeks), and not enough context and support were offered to participants. The practical implication of this possibility is that stakeholders seeking to use strengths-based interventions in the workplace should consider how to best implement such programs. For instance, Miglianico et al. (2019) recommended using a five-step integrative model with sufficient training, feedback, and support to yield optimal results. Additionally, Harzer and Ruch (2016) speculated that workers might need more than just a few weeks to integrate strengths use and experience benefits. Thus, stakeholders should consider these factors when designing a strengths-based intervention for the workplace.

Recommendations for Further Research

This study generated several recommendations for further research because of its inconclusive findings. The investigation sought to bring more clarity to the question of whether it is more beneficial to use top or bottom character strengths in the workplace. Much literature advocates for focusing on top strengths (Niemiec & McGrath, 2019; Peterson & Seligman, 2004; Schutte & Malouff, 2019). Still, there is evidence that deficit reduction can be beneficial (Abdullah et al., 2009; Anguinis & Kraiger, 2009; Lee & Bruvold, 2003; Salas et al., 2012). Prior studies that examined the impact of using top versus bottom strengths found little difference in outcomes when these different interventions were tested in student and general population samples (Proyer et al., 2015; Rust et al., 2009). Furthermore, an unpublished study conducted in the workplace context also found very little difference in results between groups

assigned to focus on top strengths versus bottom strengths (Walker, 2013). The present study suggested that it was more beneficial for employees to use their top strengths at work. However, the findings were not significant. Therefore, more research is needed to shed light on this unresolved discussion.

Future research should be based on this study's findings and its limitations. For instance, it would be helpful to conduct future studies with larger sample sizes for greater statistical power and use a different recruiting source. MTurk (Amazon Mechanical Turk, 2018) provided a convenience sample that yielded a high retention rate (78%) for the intervention. However, this sample was comprised of full-time employees who are also highly-experienced MTurk workers expecting to be paid for their participation in the study. Consequently, these participants might have different interests and motivations for participating in a strengths intervention than full-time employees who are not on the MTurk platform. Indeed, it could be interesting to replicate the study design, with modifications to the intervention, in a single organization or a series of organizations interested in bolstering their strengths-based culture.

Regardless of sample recruitment, the intervention should be modified in future studies. Time and budget constraints limited this study to a 2-week intervention, and such brevity might have contributed to the nonsignificant results. Similarly, the intervention delivery method and lack of context and support could have been limiting factors. Therefore, a future study could retain the design of allocating participants to a placebo-control group, a top strengths group, a bottom strengths group, and a combination of top and bottom strengths group. However, the intervention could be lengthened to 4 to 8 weeks, which would facilitate the application of an integrative model, such as Niemiec's (2018) aware-explore-apply approach or Miglianico et al.'s (2019) recommended five-step approach. Additionally, a future study could be conducted in-

person or employ a hybrid approach of in-person and online sessions so participants can receive feedback and support as they progress through the program.

A final recommendation is based on the study's post hoc analyses that yielded similar findings to Dubreuil et al. (2016). Namely, that the change in strengths use from preintervention to postintervention played a role in outcomes. Given these collective findings, it would be helpful to conduct a study that examined this phenomenon. The study could explore if change in strengths use is a moderating or mediating factor in the outcome of strengths interventions. Such an investigation would provide more insight for the academic community concerned with studying strengths in the workplace. In turn, it may also inform the practical application of strengths-based approaches in organizations. In summary, more research is needed to understand whether it is more beneficial to focus on applying top or bottom strengths in the workplace. It is recommended that future studies use different sample sources, modify the intervention tested, and explore the possible moderating or mediating role of change in strengths use.

Conclusion

The present study used an experimental, longitudinal approach to investigate whether character strengths interventions were effective in improving strengths use, flourishing at work, and job performance for full-time employees, ages 18-65. Specifically, whether focusing an intervention on the use of top strengths had more impact than focusing on the use of bottom strengths, or a combination of top and bottom strengths. Participants were recruited from MTurk (Amazon Mechanical Turk, 2018), and $N = 148$ completed the study. They were randomly allocated to one of four groups: a placebo-control group (journaling on early childhood memories), a group that used their top strengths at work, a group that used their bottom strengths at work, and a group that used a combination of top and bottom strengths at work. Baseline

measures of the dependent variables were recorded before the 2-week intervention, immediately following it (first posttest), and 4 weeks after it (second posttest).

A series of two-way mixed ANOVAs revealed no statistically significant findings other than for job performance, which showed a significant increase in mean scores from baseline to first posttest. Post hoc analyses revealed that participants who demonstrated at least a minimal positive change in strengths use also posted a significant increase in job performance from preintervention to postintervention. Thus, the study findings were inconclusive but instructive, suggesting that change in strengths use can impact outcomes. Further investigation is needed to bring more clarity to the issue of whether it is more beneficial to use top or bottom strengths at work. Future research should compensate for this study's limitations by using a different sample source, modifying the intervention to be longer and more comprehensive, and examining the potential moderating or mediating role of change in strengths.

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APPENDIX. INTERVENTION INSTRUCTIONS

Participants received instructions at the beginning of each week for the 2-week intervention used in this study. The instructions varied depending on the group to which participants had been randomly allocated. The specific instructions provided were as follows.

Week 1

1. Group A: placebo-control. Your activity this week is to write about early memories every day. Think back to your childhood or younger years and each day write about this memory and how you feel about it. You can do this activity at any time during the day, but please remember to do it each day for the upcoming week. It's a good idea to print out or write down these instructions so you have them handy as reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/memories) to help you journal each day. Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.
2. Group B: top strengths. Look at your character strengths assessment results and pick one of the top five strengths on your report. Use this top strength in a new and different way every day at work this week. You can apply the strength in a new situation or when interacting with a "new" person. It is up to you how you want to apply this particular strength in a new or different way at work each day. It's a good idea to print out or write down these instructions so you have them handy as a reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/strengths) to record how you used your chosen top strength each day. If you're wondering how you might use the selected top strength in

new or different ways, here is a resource (http://thecsresearchstudy.org/ideas) that provides ideas for each of the character strengths. Of course, you don't have to use these – they're just some ideas to get your creative juices flowing. :-) Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.

3. Group C: bottom strengths. Look at your character strengths assessment results and pick one of the bottom five strengths on your report. Use this bottom strength in a new and different way every day at work this week. You can apply the strength in a new situation or when interacting with a "new" person. It is up to you how you want to apply this particular strength in a new or different way at work each day. It's a good idea to print out or write down these instructions so you have them handy as a reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/strengths) to record how you used your chosen bottom strength each day. If you're wondering how you might use the selected bottom strength in new or different ways, here is a resource (http://thecsresearchstudy.org/ideas) that provides ideas for each of the character strengths. Of course, you don't have to use these – they're just some ideas to get your creative juices flowing. :-) Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.
4. Group D: top and bottom strengths. Instructions were similar to those used for groups 1 and 2 above. Random assignment was used to ensure that approximately half the respondents in this group were allocated to use a top strength in the first week and a

bottom strength in the second week. The other half were assigned to use a bottom strength in the first week and a top strength in the second week.

Week 2

1. Group A: placebo-control. Your activity this week is to continue writing about your memories every day. You can either continue with early memories from your childhood or you can select memories that are more recent. It's up to you which memories you choose to write about each day and how you feel about them. You can do this activity at any time during the day, but please remember to do it each day for the upcoming week. It's a good idea to print out or write down these instructions so you have them handy as reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/memories) to help you journal each day. Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.
2. Group B: top strengths. Look at your character strengths assessment results again and this time pick another one of the top five strengths on your report. Use this top strength in a new and different way every day at work this week. Make sure it is a different top strength than the one you focused on and used last week. You can apply the strength in a new situation or when interacting with a "new" person. It is up to you how you want to apply this particular strength in a new or different way at work each day. It's a good idea to print out or write down these instructions so you have them handy as reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/strengths) to record how you used your chosen strength each day. If you're wondering how you might use the selected

strength in new or different ways, here is a resource (http://thecsresearchstudy.org/ideas) that provides suggestions for each of the character strengths. Of course, you don't have to use these – they're just some ideas that might help. Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.

3. Group C: bottom strengths. Look at your character strengths assessment results and this time pick another one of the bottom five strengths on your report. Use this lesser or lower strength in a new and different way every day at work this week. Make sure it is a different lesser or lower strength than the one you focused on and used last week. You can apply the strength in a new situation or when interacting with a "new" person. It is up to you how you want to apply this particular strength in a new or different way at work each day. It's a good idea to print out or write down these instructions so you have them handy as reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/strengths) to record how you used your chosen strength each day. If you're wondering how you might use the selected strength in new or different ways, here is a resource (http://thecsresearchstudy.org/ideas) that provides suggestions for each of the character strengths. Of course, you don't have to use these – they're just some ideas that might help. Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.
4. Group D: top and bottom strengths. Last week, you used one of your (top/lesser or lower) strengths at work each day. This week is going to be a little different. Look at your character strengths assessment results again and this time pick one of the

(bottom five/top five) strengths on your report. Use this (lesser or lower/top) strength in a new and different way every day at work this week. You can apply the strength in a new situation or when interacting with a "new" person. It is up to you how you want to apply this particular strength in a new or different way at work each day. It's a good idea to print out or write down these instructions so you have them handy as reminder each day. Also, you can download and print out this worksheet (http://thecsresearchstudy.org/strengths) to record how you used your chosen strength each day. If you're wondering how you might use the selected strength in new or different ways, here is a resource (http://thecsresearchstudy.org/ideas) that provides suggestions for each of the character strengths. Of course, you don't have to use these – they're just some ideas that might help. Thanks for participating! We'll send you a couple of reminder messages during the week to help you stay on track with the activity.