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UNDERSTANDING AND PREDICTING MULTITASKING PERFORMANCE USING NON-COGNITIVE VARIABLES: ADDRESSING ISSUES IN PAST RESEARCH AND DEVELOPING A NEW MEASURE OF INDIVIDUAL POLYCHRONICITY

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ABSTRACT

UNDERSTANDING AND PREDICTING MULTITASKING PERFORMANCE USING NON-COGNITIVE VARIABLES: ADDRESSING ISSUES IN PAST RESEARCH AND DEVELOPING A NEW MEASURE OF INDIVIDUAL POLYCHRONICITY

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The purpose of the current study is to improve the understanding and prediction of multitasking performance using non-cognitive predictors. The paper has two main goals. The first goal is to improve upon the models and methodology used to explore the relationships between non-cognitive variables and multitasking performance. To this end, I review non-cognitive predictors of multitasking performance and highlight a major methodological issue. The second goal is to develop a new measure of polychronicity, a non-cognitive variable that shows promise as a predictor of multitasking performance because it reflects an individual's preference for engaging in multitasking. Following a discussion of issues with current definitions and measurement of polychronicity, I present the details of the development and evaluation of a new measure of polychronicity. I then present a study that tests pieces of a theoretical model that contain relationships between polychronicity, other non-cognitive predictors and multitasking performance. Though the new measure of polychronicity is not found to be a significant predictor of multitasking performance, the measure shows acceptable reliability and validity and does predict outcomes such as enjoyment of the multitasking simulation and the choice to multitask again. In addition, the study shows evidence of having addressed the methodological issue present in previous research.

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INTRODUCTION

Purpose and Organization

Multitasking has become an important component of work performance for many types of jobs (e.g., Bühner, König, Pick, & Krumm, 2006). Although a large body of research has established that general cognitive ability predicts complex task performance such as multitasking performance, research investigating non-cognitive predictors of multitasking performance has been sparse and inconclusive. The purpose of the present paper is to address two of the most prominent limitations in this area. The first is the fact that many studies in the area allude to, but do not explicitly examine, arousal or anxiety as proximal mediators of the relationship between non-cognitive traits such as personality and multitasking performance. The second is that polychronicity, a non-cognitive variable reflecting individuals' preference for multitasking, has not been well defined and measured. Conceptually, polychronicity shows promise as a predictor of multitasking performance, and thus I think that developing an improved measure of polychronicity is a key area for improvement. In order to address these limitations, the current paper describes the development of a new measure of polychronicity, based on a more careful definition, and then tests the relationships between polychronicity and other non-cognitive predictors and multitasking performance, using anxiety as a mediator.

The organization of the paper is as follows: First, I will introduce the concept of multitasking and review the key pieces of literature on non-cognitive predictors of multitasking performance. The review will clarify the need for methodological improvement, and I will discuss specific ways through which this improvement can be made. Next, I will focus on polychronicity as a non-cognitive variable that I have

identified as having particular promise as a predictor of multitasking performance. The construct of polychronicity will be examined with respect to its historical definition and measurement, and I will put forth a more precise definition and develop an improved measure. Finally, building off of this improved definition and measure of polychronicity, I will present a study that tests theoretical relationships between multitasking performance and non-cognitive predictors, including polychronicity. Multitasking will be operationalized via computer simulation in an experimental setting that allows for controlled measurement and manipulation of the relevant variables in the study.

Multitasking Overview

"We live in a moment of history where change is so speeded up that we begin to see the present only when it is already disappearing." R. D. Laing (1983)

In today's world of instant communication, technological innovation, and information overload, the pace of life is rapidly increasing. The pressure to do more in less time, often with frequent interruptions, is greater than ever. As a result, multitasking has become a necessity in both home and work life for many individuals (e.g., Bühner, König, Pick, & Krumm, 2006). Though the term *multitasking* is heavily used in popular culture and is relatively well understood colloquially, it is also a subject of research whose development is still in its youth within the organizational literature. Definitions of multitasking have varied, particularly with respect to their specificity. Many studies lack a definition of multitasking altogether or refer to multitasking by another name, such as "attentional performance" (e.g., Szymura & Necka, 1998). Oswald, Hambrick, and Jones (2007) offer a useful definition of multitasking. Thus, I will utilize their definition of multitasking as "performance on multiple tasks, with shifts in attention...over a short

time span, (p. 80-81)" where both tasks and time span can be measured subjectively and objectively.

Multitasking at Work

Multitasking has become an important component of job performance for many workers (Delbridge, 2000). In fact, some authors have recently suggested that almost every job requires at least some degree of multitasking (Bühner, König, Pick, & Krumm, 2006). The necessity for multitasking at work has resulted from a number of factors, including increases in technology. Technology has not only increased the speed of information transfer in the workplace, but also the frequency of task interruption. For example, an interoffice memo no longer takes days to circulate to everyone in an office and back to the sender; emails are now sent and received almost instantaneously and responses are often expected within hours, if not minutes. The phenomena of downsizing and job enrichment have also contributed to the increased demands placed on many of today's workers; one employee may be expected to perform the same amount of work that would have been previously expected of two or more employees. In fact, the nature of work has changed so much that some have suggested that traditional notions of job performance are now outdated for many jobs (Ilgen & Pulakos, 1999). In many cases, successful workers must not only be good at performing each of the tasks they are responsible for; they must now also be good at weaving those tasks together in an environment of interruption and uncertainty (Delbridge, 2000; Persing, 1999). Therefore, predicting multitasking ability in job applicants should contribute to prediction of their overall performance on the job for a wide variety of occupations (e.g., Damos, 1993; Stankov, Fogarty, & Watt, 1989).

Multitasking performance may be distinct from task or overall performance because of the unique pressures placed on an individual in a multitasking situation. Multiple tasks place interrelated and distinct demands on an individual's knowledge, skills, and cognitive resources. The activity of *interleaving* or *coordinating* these tasks places additional cognitive demands on the performer (e.g., Ackerman, Schneider, & Wickens, 1989). Thus, the coordination and time management strategies required in the multitasking environment place demands on the performer that go beyond the additive demands required by the tasks taken individually. These task coordination efforts require executive processes such as goal shifting and rule activation (Rubinstein, Meyer, & Evans, 2001). As a result, it is perhaps unsurprising that cognitive ability has been shown to predict performance at multitasking (Salthouse, Hambrick, Lukas, & Dell, 1996).

In addition to cognitive demands, the 'balancing act' of managing task switches and interruptions – or even the anticipation of having to do so – may lead a multitasker to have a wide range of affective reactions such as stress, anxiety, excitement, or some combination of these (Delbridge, 2001). Although some people may find the relative chaos of a multitasking situation to be stimulating and motivating, others may find it overwhelming and stressful (Oswald, Hambrick, & Jones, 2007). As a result, there is reason to believe that some non-cognitive variables may take on an important role in the prediction of multitasking performance as well. The notion that cognitive factors are necessary but not sufficient when predicting complex task performance is not new. In 1965, Guion and Gottier noted that information on both "can-do" factors (intelligence) and "will-do" factors (motivational or personality characteristics) is essential in order to gain a more complete understanding of work performance. More recently, Murphy

(1996) reiterated this point, stating that although cognitive ability may be the most parsimonious way to predict performance, to understand performance fully we must consider other factors such as personality and motivational influences.

Non-cognitive Predictors of Multitasking

Past research on non-cognitive predictors of multitasking has typically examined those characteristics with the potential to predict an individual's reactions to the arousal or stress often experienced during multitasking. Though research to-date in the area has been relatively limited, the most commonly researched non-cognitive predictors of multitasking have been extraversion, neuroticism, Type A Behavior Pattern, and polychronicity.

Extraversion and Neuroticism

Extraverts, due to their lower baseline level of arousal and higher need for stimulation, tend to perform better in situations where they are highly stimulated (König, Bühner, & Mürling, 2005). Conversely, introverts, having a relatively high level of baseline arousal, prefer less stimulation and perform better on tasks that are less stimulating. Therefore, due to the highly stimulating nature of multitasking, extraverts are generally predicted to perform better than introverts (Lieberman & Rosenthal, 2001; Szymura & Necka, 1998).

König, Bühner, and Mürling (2005) examined extraversion as a predictor of multitasking ability. The multitasking scenario used was the *Simultaneous Capacity/Multi-Tasking* (SIMKAP) program. Following a training session, participants performed the simulation which consisted of three main tasks that were performed together, along with a fourth task that periodically interrupted the other three. The three

main tasks consisted of simple operations such as crossing off numbers or doing word puzzles, and the fourth was made to resemble interruptions that might occur via such technology as email (e.g., a message stating "You are invited to a party on Friday – can you attend?" would pop up along with a date book containing the answer). The researchers performed hierarchical regression analyses to test the predictive and incremental validity of the cognitive and non-cognitive measures used, respectively, finding that though cognitive variables predicted multitasking performance, personality variables (extraversion and polychronicity) did not provide additional prediction over and above cognitive variables.

Lieberman and Rosenthal (2001) focused on introversion in the context of interpersonal communication, which is viewed as a type of multitasking. Their prediction was that introverts would have less capacity for multitasking as a result of their already high arousal levels, and they would therefore be less successful at decoding nonverbal cues during interpersonal interaction. The authors conducted three studies in which they assessed nonverbal decoding skill using various interpersonal situations. Overall, the authors concluded that introversion was related to poorer nonverbal decoding due to deficits in multitasking ability, but only when the nonverbal decoding task was secondary to other tasks (i.e., there was no difference when the decoding task was primary). The authors posited that this was due to the fact that introverts were focusing on only the primary task and ignoring the secondary task in order to lower their levels of arousal. Despite some inconsistency in the results, these studies support the notion that extraversion may be a valid predictor of multitasking ability.

Szymura and Necka (1998) and Szymura and Wodnieka (2003) examined both extraversion and neuroticism in relation to multitasking performance. They discuss the relationship between these constructs and multitasking performance in relation to Gray's (1981) Behavioral Inhibition and Behavioral Activation Systems (BIS and BAS, respectively). Briefly, the BAS is responsible for approach types of behaviors (e.g., increased attention to the task), whereas the BIS is responsible for avoidance types of behaviors (e.g., decreased attention to the task). Specifically, the authors hypothesize that the behavior of highly neurotic or highly introverted individuals is controlled more by the BIS. The high level of stimulation in the multitasking environment, the authors contend, will activate the BIS in these people as a result of their hypersensitivity to incoming stimuli, resulting in avoidance or withdrawal behaviors and performance decrements. The multitasking simulation used in this research involved a signal detection task in which participants had to identify a probe letter from a field of distractors. In the first group of studies, the authors found support for the arousal model of selective attention; that is, they found evidence that extraverts tend to perform better at multitasking due to low baseline arousal and a desire for highly stimulating activity. In addition, they found that high levels of neuroticism generally resulted in performance deficits. In the second group of experiments, the authors were able to replicate some of the relationships found in the first group of experiments; however results were much more mixed.

In a dissertation, Delbridge (2000) also measured extraversion and neuroticism in an attempt to predict multitasking performance. Her hypotheses were based on a model of multitasking that focused on the stressful nature of a multitasking situation and the

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likelihood that personality variables would predict multitasking performance through the use of coping behaviors. Specifically, characteristics such as neuroticism were predicted to increase perceptions of stress and, as a result, increase coping behaviors. Delbridge hypothesized that increased coping would result in withdrawal and lowered performance. Significant effects were not found for either extraversion or neuroticism. However, the author implicated a methodological issue in this study that will be addressed later for the lack of significant findings.

Type A Behavior Pattern

Type A behavior pattern (TABP) is a multidimensional construct consisting of time urgency, achievement strivings, and impatience/irritability (Conte, Schwenneker, Dew, & Romano, 2001; Ishizaka, Marshall, & Conte, 2001). The theoretical relationship between TABP and multitasking performance is somewhat similar to that of extraversion and neuroticism; that is, they both have been examined with respect to arousal hypotheses (De la Casa, Gordillo, Mejias, Rengel, & Romero, 1998; Ishizaka, Marshall, & Conte, 2001) and stress perception hypotheses (Conte, Schwenneker, Dew, & Romano, 2001; Delbridge, 2000; Kirmeyer, 1988).

Studies examining TABP and its resulting attentional strategies in relation to multitasking performance have been somewhat successful in finding the hypothesized relationships. De la Casa, Gordillo, Mejias, Rengel, and Romero (1998) examined the attentional strategies of Type A individuals in two types of situations. In the first situation, one task was labeled as "important" and one as "unimportant", supposedly making the prioritization of tasks clear. In the second situation, one task was labeled as "important" and the second was presented without an importance label, making

prioritization unclear. The primary task was to cross off probe symbols on a screen, and the secondary task was to remember words that would periodically appear on the screen. Their first experiment found support for the idea that Type As relied on a hypervigilance strategy (i.e., to focus intensely on all stimuli presented, even irrelevant ones) and thereby performed better than Type Bs on the *secondary* tasks. In their second experiment they found that Type As selected a hypervigilance strategy only in the ambiguous condition. In the dual-task condition, Type As focused intensely on only the main task. In both situations in the second experiment (ambiguous versus dual-task), the attentional strategies selected by Type A individuals resulted in decrements in overall performance as compared with Type Bs.

Ishizaka, Marshall, and Conte (2001) did not find a significant relationship between an overall measure of TABP and multitasking performance. In this study, multitasking performance was operationalized as performance at three simultaneous tasks, two of which were visual (a gauge monitoring and an arithmetic task) and one of which was auditory (listening to and remembering spoken words). However, they did find some support for a relationship between facets of TABP and performance on certain tasks in specific situations. The significant relationships, however, were extremely variable and taken together would indicate that overall, TABP and its subcomponents were not predictive of multitasking performance. The authors noted that a major weakness of their design was the relative ease with which participants completed the tasks. The low difficulty of the tasks probably reduced both the stressful nature of the task and the variability of the data.

Though Kirmeyer (1988) did not focus directly on the effect of TABP on performance in a multitasking situation, she did examine the relationship between TABP and perceptions of stress in a multitasking environment (police dispatchers). She found that Type A individuals perceived both high workload and interruption as more stressful than their Type B counterparts. Although there was no measure of actual performance in this study, the results coincide nicely with the majority of research in this area. Taken together, results for Type A Behavior pattern have been somewhat supportive of the notion that it has potential as a predictor of multitasking performance.

Polychronicity

Polychronicity is an individual's preference for performing multiple tasks at once (Slocombe & Bluedorn, 1999). Though interest in polychronicity has increased in recent years (a 1999 issue of the *Journal of Managerial Psychology* was dedicated entirely to polychronicity), empirical studies testing the relationship between polychronicity and multitasking performance have been somewhat rare and have achieved less than promising results. For instance, both König, Bühner, and Mürling (2005) and Delbridge (2000) both included polychronicity in their explorations of non-cognitive predictors of multitasking, but as with the other predictors, they failed to find a significant relationship between polychronicity and multitasking performance. The limitations of these studies, to be discussed later, point the way toward improvements built into the present study.

Though Conte and Jacobs (2003) did not examine the relationship between polychronicity and multitasking performance, they did examine polychronicity in relation to other work outcomes: absence, lateness, and overall performance. Their hypotheses, based mainly on the idea that polychronic individuals tend to be less time aware than

their monochronic counterparts, were that polychronicity would be positively correlated with absence and lateness and negatively correlated with performance ratings. Though the authors found that polychronicity did in fact correlate positively with absence and lateness and negatively with overall performance ratings, this finding is not necessarily in conflict with the contention that polychronicity will relate positively to multitasking performance. Importantly, the employees studied by Conte and Jacobs (2003) were train operators, an occupation whose level of multitasking was not assessed, making it difficult to tell how large a role it plays. Even if multitasking were a large portion of this job, the performance ratings used in the study were based solely on aspects of timeliness (e.g., schedule adherence and dependability). For these reasons, the negative relationship between polychronicity and performance found in this study is not necessarily contradictory to the positive relationship between polychronicity and *multitasking* performance that has been proposed.

Slocombe and Bluedorn (1999), instead of testing relationships between individual polychronicity and performance, analyzed the congruence between individuals' preferred level of polychronicity and the level of polychronicity individuals experienced in their workgroup. They found that when individuals both preferred and experienced a high level of polychronicity, they were more willing to exert effort on behalf of the organization as compared with situations in which there was a large difference between preferred and experienced polychronicity. In addition, when preferred polychronicity was equal to or higher than experienced polychronicity, organizational commitment was high. Conversely, when preferred polychronicity was less than experienced polychronicity, commitment was lower. When preferred and

experienced polychronicity were equal, belief in and acceptance of organizational goals and fairness of performance evaluation were highest. When the two diverged in either direction, both acceptance and fairness evaluations decreased. The researchers also attempted to examine whether congruence between preferred and experienced polychronicity affected performance. Results for this outcome were mixed and difficult to interpret; however overall, the findings show that polychronicity can have an effect on important organizational outcomes such as effort and committment.

Summary of Past Research on Non-cognitive Predictors of Multitasking

As can be seen, empirical research exploring the relationships between non-cognitive predictors and multitasking performance has been largely unsuccessful in finding the hypothesized relationships. Though many methodological limitations could be detailed with respect to most of the studies just reviewed, two major areas have been particularly problematic and must be addressed before concluding a lack of relationship. Conceptually, the hypothesized relationships between non-cognitive variables and multitasking depend on arousal or anxiety, yet most research has been flawed in this respect in three ways. First, the multitasking operationalizations used by researchers have either not been evaluated with respect to how arousing they are, or they have actually been found to be much less arousing than the researchers had expected, often due to their simplicity or lack of realism (e.g., Ishizaka, Marshall, & Conte, 2001). Second, anxiety and arousal are not formally hypothesized or tested as mediators of the relationship between non-cognitive predictors and multitasking performance. Third, no distinction is made between the two concepts of anxiety and arousal, although there is reason to believe that differences may exist between the two concepts (Lundqvist, 2006).

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In addition to the problems associated with the role of anxiety or arousal, significant issues also exist with respect to polychronicity. I will now address each of these issues in turn.

First, studies not evaluating how arousing their multitasking situations are leave open the possibility that participants simply are not experiencing the higher levels of arousal or anxiety that are necessary for the relationship between non-cognitive variables and multitasking to become evident. For example, König, Bühner, and Mürling (2005) used a task with relatively high fidelity but did not provide any evidence from past research or from their own research that the task was arousing to participants (e.g., by way of a manipulation check and/or comparison to some sort of baseline or control group). Because there is no way of knowing whether the participants were experiencing the arousal that was hypothesized, conclusions about the relationship between non-cognitive predictors and multitasking performance are tentative at best.

When researchers have evaluated how arousing or anxiety producing the tasks they have used are, they have found disappointing results. Delbridge (2000) evaluated how arousing the multitasking paradigm used in her study was and found that although participants did engage in multitasking, the design included frequent breaks that greatly reduced stress levels and thereby potentially attenuated the relationships between the personality variables, stress perceptions, and multitasking performance. Ishizaka, Marshall, and Conte (2001) also pointed out that a major weakness of their design was the relative ease with which participants completed the tasks. The low difficulty of the tasks and/or the ease of coordinating these tasks, probably reduced both the stressful nature of the task and the variability of the data due to ceiling effects.

The present study addresses this first issue by utilizing a multitasking simulation that possesses a number of variable task characteristics that allow the experimenter to tailor the simulation to produce arousal in participants. As was discussed, past researchers seemingly did not choose a multitasking simulation with its capacity for inducing arousal in mind. In addition to utilizing the multitasking simulation described above, the present study also measures state arousal during the multitasking simulation in order to verify that heightened arousal was in fact experienced by participants.

Second, past researchers have used the terms arousal and anxiety almost interchangeably. Although the two are closely related and it is quite plausible to suggest that a person engaging in multitasking might be experiencing both, there is a meaningful difference between the two in the performance context. Whereas arousal reflects a generalized state of "activation" or "readiness", anxiety reflects a type of unpleasant arousal experienced as a reaction to actual or imagined stressors (Lundqvist, 2006). As such I will characterize arousal during multitasking as consisting of two components: anxiety (bad or unpleasant arousal) and excitement (good or "activated" arousal). It is my view that the two will have different implications for multitasking performance. Excitement, though it may be related to one's general enjoyment of the multitasking experience, is not expected to be related to performance. Anxiety, however, as one of the most commonly accepted causes of performance deficits (Humphreys & Revelle, 1984) is expected to mediate the relationship between non-cognitive predictors and multitasking performance.

Third, although often mentioned in previous research, the intervening causal variables (whether dubbed arousal or anxiety) were not measured or included in the

analysis as mediators. The present study remediates this by both measuring and formally testing anxiety as a mediator of the relationships between non-cognitive variables and multitasking performance.

Finally, though a number of different non-cognitive variables have been examined thus far due to their potential relationships with multitasking, research involving polychronicity has been particularly problematic with respect to its definition and measurement. Because conceptually, this variable shows promise as a predictor of multitasking, a great deal might be gained by focusing on and improving research involving polychronicity. In order to address this issue, the current study will review past definitions and measures of polychronicity and suggest improvements both conceptually and methodologically.

Polychronicity

As was discussed earlier, polychronicity indicates the preference or tendency to prefer multitasking as opposed to performing only one task at a time (e.g., Bluedorn et al., 1999). Because polychronicity likely reflects both past experience with multitasking, and also perhaps a more stable tendency to perceive multitasking as enjoyable and rewarding rather than stressful, polychronicity should be a particularly useful predictor of multitasking. As compared with such broader and more stable traits as extraversion, neuroticism, and Type A behavior pattern, polychronicity is perhaps also more appropriate in scope when one is attempting to predict multitasking performance versus job performance in general. For these reasons, pursuing polychronicity as a predictor of multitasking performance should be of value. However, a number of serious problems currently exist with both the definition and measurement of polychronicity that must be

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addressed in order for research examining polychronicity and multitasking performance to be productive. I will review those next.

Definitional Issues with Polychronicity

In current organizational research, polychronicity is mainly used as an individual difference variable, yet the origins of polychronicity lie in the study of human cultures. When Hall (1959) first defined polychronicity, his goal was to describe the extent to which a culture values performing multiple tasks at once. His research was very qualitative in nature, his descriptions of "polychronic" or "monochronic" cultures were rich and detailed, and his definition of polychronicity was multifaceted. Researchers have since become interested in applying the construct of polychronicity to more micro levels such as the organization, the group, and the individual and have and attempted to adopt Hall's definition for these studies as well. For the most part, researchers have ignored the potential dangers of applying the same definition of polychronicity from the cultural level of analysis to the individual level, and have simply imposed the cultural level definition onto the organizational and individual levels wholesale.

Cultural- or Organizational-level Definitions

Hall and Hall (1990) defined polychronicity in the following way:

> ...a polychronic culture is a culture in which people value, and hence practice, engaging in several activities and events at the same time. Monochronic cultures are more linear in that people prefer to be engaged in one thing at a time (p. 13).

In addition to this definition, their descriptions of polychronicity not only captured the preference for engaging in multiple tasks at once, but also the belief that this cultural preference is the "right way" to do things. They also included many qualitative descriptions of the characteristics of "polychronic" and "monochronic" cultures that have

very little to do with the performance of tasks. Following in Hall and Hall's footsteps were Bluedorn, Kalliath, Strube, and Martin (1999), who define polychronicity at the cultural level as "the extent to which people in a culture prefer to be engaged in two or more tasks or events simultaneously and believe their preference is the best way to do things" (p. 207), a definition that also confounds preference with correctness.

A final definition at the cultural level is one by Onken (1999), who defines polychronicity as "...a fundamental and deeply imbedded cultural dimension, polychronicity is a dimension of human time that involves the extent to which activities are organized by scheduling two or more events at one time" (p. 231). Definitions very similar to the three listed above have been used by others (e.g., Persing, 1999; Slocombe, 1999; Slocombe & Bluedorn, 1999) as well.

Polychronicity at the organizational level has been defined in much the same way as polychronicity at the cultural level by most researchers. Benabou (1999), however, gives a somewhat different definition of polychronicity at the organizational level. He uses the term *P-time* to refer to polychronicity and the term *M-time* to refer to monochronicity, and states that:

> In P-time, nothing is truly stable: everything is in flux and changing. Here we enter into a system that is abstract, intangible, regulated more by events and tacit communication than by time on the clock. Anything and everything can occur unpredictably and interchangeably (p. 259).

Palmer and Schoorman (1999) attempted to make clearer the definition of polychronicity at the organizational level by defining characteristics they thought were implied, but not stated directly in the definitions of other researchers. The three characteristics of polychronicity that Palmer and Schoorman describe were contained within the writings of Hall (1959) and Hall and Hall (1990), but were often ignored by

other researchers. Palmer and Schoorman's definition of polychronicity consists of three components: time use preference, time tangibility, and context. Time use preference is the extent to which people within a culture prefer to do things one at a time or in coordination and is the part of their definition that is clearly most similar to previous definitions. Time tangibility is the extent to which time is perceived within a culture as being quantifiable (i.e., is time segmented or does it "flow"). In polychronic cultures, time "flows" and is not kept strictly by observance of the clock or of strict schedules.

The context portion of Palmer and Schoorman's definition of polychronicity is somewhat more complex than the previous two, and the largest divergence from previous definitions. Communication within polychronic cultures is characterized as being "high context", meaning that information and meaning essential to a message are embedded in the context surrounding the message rather than simply within the message itself (Palmer & Schoorman, 1999). This somewhat confusing description was clarified by Hall, who gave the example of attempting to tell a humorous story to a friend, and eventually relenting "I guess you just had to be there" (Hall, as interviewed by Bluedorn, 1998, p. 112). Monochronic cultures are seen as being "low context", which means that most of the information conveyed by a message is found within the message itself, and the surrounding context is unnecessary.

Taken together, both the cultural and organizational level definitions of polychronicity are often complex and multifaceted, which is probably appropriate when attempting to describe the phenomenon at this level. The direct application of many of these characteristics to the individual level definition, however, needs to be done with

caution. In addition, there may be unique issues to address with respect to polychronicity as it applies to individuals.

<center>*Individual-level Definitions*</center>

Definitions of polychronicity at the individual level have been highly varied and often quite complex as a result of researchers adopting some of the cultural level dimensions and leaving others out. It is also important to note that it is frequently difficult to even pick out the definition in articles researching individual-level polychronicity, as the descriptions are often so broad. Perhaps the most useful way to distinguish the research on individual-level polychronicity is to describe studies defining polychronicity in terms of behavior and those defining it in terms of preference.

Behavior-based Definitions

Perhaps the fundamental individual-level definition is given in an article by Bluedorn, Kaufman, and Lane (1992). Here, polychronicity is defined as:

> ...focusing entirely on one task, is the monochronic approach to life: do one thing at a time...simultaneously being actively involved in two or more activities, [is] termed [a] polychronic approach. And as implied by the word 'approaches', there are degrees of polychronicity, ranging from people who tend to be very monochronic to those who are extremely polychronic (p. 17).

Benabou (1999) gives a definition of polychronicity that includes theoretical reasons for the behavior of polychronic or monochronic individuals.

> Polychronic individuals do several things at a time (for example, having two or three projects in hand); they are more strongly oriented toward the present and feel themselves less bound to a timetable or a procedure than monochronic individuals. They view time as an inexhaustible resource and interpersonal relations are at least as important for them as the work to be performed, which is not the case for monochronic individuals, whose extreme concentration or dedication to one particular task relegates interpersonal communication to a position of secondary importance, either temporarily or more permanently...monochronicity and polychronicity are not two distinct concepts, but the opposite poles of a single concept (p. 261).

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Cotte and Ratneshwar (1999) assert that "We know how to describe polychronicity; it is when a person does more than one activity, apparently at the same time, or even when one treats unplanned interruptions as equal to planned activities" (p. 184). Kaufman, Lane, and Lindquist (1991) define polychronicity as being when "two or more activities are performed within the same time block, apparently at the same time" (p. 393).

Preference-based Definitions

Conte, Rizzuto, and Steiner (1999) define polychronicity as "the extent to which an individual prefers working on several tasks at once as opposed to working on only one task at a time" (p. 269) and König, Bühner, and Mürling (1999) describe it as "…the preference for multitasking and the belief that one's preference is the best way to handle things" (p. 243).

Persing (1999), in an attempt to clarify the definition of polychronicity, instead provided a particularly confusing set of definitions. Her definition of polychronicity at first involves behavior. "At its most basic, polychronicity is the doing of two or more things simultaneously" (p. 358). She then makes a point that:

> In individual polychronicity, the individual prefers to do several things more or less at once, including not only visible activities, but the tasks of thought. Individual polychronicity is not a single behavior but a relatively enduring preference. In individual monochronicity, the individual prefers to do things one at a time, including not only visible activities, but tasks of thought. Likewise, individual monochronicity is not a single behavior but a relatively enduring preference (p. 365).

It seems clear here that polychronicity is a preference and not a behavior, but later on the same page, Persing states that "At the level of the individual, polychronicity focuses on the number of related and unrelated tasks, activities, and stimuli an individual attends to,

participates in, and is involved in literally at one time..." (p. 360). Persing also states that "...although the definition of polychronicity has remained consistent on this point, it must be emphasized again that individual polychronicity is the preference to engage in several activities more or less at once, not the behavior of doing several things at once" (p. 360).

Resolving Definitional Issues

As has been shown, the definition of polychronicity has been relatively unclear and inconsistent in the literature thus far. In addition to the application of different aspects of the cultural-level definition at the individual level, polychronicity has been conceptualized by researchers as both a behavior and a preference. This is an important distinction worth making because a person may prefer to behave in a certain way (e.g., monochronic) yet may be forced or feel compelled to behave in a different manner (e.g., polychronic), either by the requirements of his or her job or by the norms of the organization. Because a behavior-based definition of polychronicity is essentially nothing more than a repetition of the definition of multitasking performance, it is essential for a definition of polychronicity to focus on preference.

A more precise definition of polychronicity is predicated on a clearer conceptualization of multitasking. Regarding the latter, the vagueness associated with statements such as "performing multiple tasks at one time" leave open a myriad of difficult questions such as what "tasks" are and what "time" means. Researchers have recently suggested, however, that a key element of multitasking is the shifting of attention among tasks, both objectively and through an individual's subjective perceptions (Oswald, Hambrick, & Jones, 2007). Thus, the definition that I offer is that

individual polychronicity is a non-cognitive variable reflecting *an individual's preference for shifting attention among ongoing tasks, rather than focusing on one task until completion and then switching to another task.* "Task" here is defined as a discrete set of activities engaged in for the purposes of attaining a goal.

Given the problems present in the literature with respect to the definition of polychronicity, it is of little surprise to note that the measurement of polychronicity has also been flawed in a number of ways. In order to better understand problems with the current measurement of polychronicity, a review of current measures is next.

Existing Measures of Polychronicity

The PAI

The first and less frequently used of the two major measures of polychronicity in use is the Polychronic Attitudes Inventory developed by Kaufman, Lane, and Lindquist (1991). To develop this instrument, the authors first generated 15 items they thought best addressed polychronic behavior. Due to low item-total correlations, however, the authors eliminated *11 items* (i.e., almost 75% of the original items). The 4-item measure was found to have an internal consistency reliability of α = .68, judged to be acceptable due to the fact that it would be used in the "early stages of research" (p. 395). Items from the PAI are as follows (1-3 are reverse-scored):

1. I do not like to juggle several activities at the same time.
2. People should not try to do many things at once.
3. When I sit down at my desk, I work on one project at a time.
4. I am comfortable doing several things at the same time.

First, it is important to note a few key methodological issues apparent in the development of this measure. The elimination of 11 out of the original 15 items means that the 4-item measure may be content and construct deficient in important ways.

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Because the 15 original items were not provided, however, it is difficult to evaluate whether or not this has occurred. In addition, the relatively low alpha means that a great deal of the variance in scores on the PAI is likely due to measurement error, which has the potential to attenuate its relationships with other measured variables. Second, the measure includes items measuring behavior and items measuring preference. As was noted earlier, it is clear that behavior and preference are two distinct concepts, and thus including them in a supposedly unidimensional measure is inappropriate due to construct confounding.

The IPV

By far the most commonly used measure of polychronicity is the Inventory of Polychronic Values, developed by Bluedorn, Kalliath, Strube, and Martin (1999). This measure, in its original and in many altered forms, has been used in the majority of the research on polychronicity. An important caveat here is that the IPV was designed to measure polychronicity at the cultural level, but in practice, it is used almost exclusively at the individual level. Bluedorn et al. assert in a footnote that "a sizeable amount of unpublished data...indicates that the IPV can be easily modified to provide an equally valid and reliable measure of individual-level polychronicity" (p. 227). In order to do so, one must simply replace the word *we* with the word *I* whenever necessary.

The IPV was constructed as an attempt to improve upon Kaufman et al.'s PAI measure, mainly with respect to internal consistency reliability. Bluedorn et al. (1999) began with Kaufman's items, which they edited and expanded upon, resulting in a 10-item scale. Alpha for the 10 item scale was $\alpha = .86$, which the authors judged to be significantly higher than the previous measure and thus satisfactory.

The authors then assessed test-retest reliability, content validity, discriminant, convergent, and nomological validity (i.e, nomological network of related constructs), and found the IPV acceptable in all areas. Responses to the final measure were collected on a 7-point Likert-type scale (1=strongly disagree, 7=strongly agree). Items are as follows (R = reverse scored):

1. We like to juggle several activities at the same time
2. We would rather complete an entire project every day than complete parts of several projects (R)
3. We believe that people should try to do many things at once
4. When we work by ourselves, we usually work on one project at a time (R)
5. We prefer to do one thing at a time (R)
6. We believe people do their best work when they have many tasks to complete
7. We believe it is best to complete one task before beginning another (R)
8. We believe that it is best for people to be given several tasks and assignments to perform
9. We seldom like to work on more than a single task or assignment at the same time (R)
10. We would rather complete parts of several projects every day than complete an entire project

Modifications of the IPV

Though the full IPV showed satisfactory reliability and validity in many ways, most researchers who use the scale use a modified or shortened version. Typically no reasons are given for which items are dropped, why they are dropped, or how and why the response scale is altered, however. An important note is that researchers should use measures that operationalize the definition of their respective constructs as faithfully as possible. By contrast, many polychronicity researchers operate from a definition of polychronicity that includes only the preference for performing multiple tasks, but measure polychronicity using the IPV. Because the IPV contains items which assess the belief that others ought to share this preference as well (see items 3, 6, and 8 above),

researchers are often measuring polychronicity with a measure that contains extra content that contaminates the construct they are seeking to measure.

Summary of Issues with Current Measurement

Measures of polychronicity currently in use suffer from three major flaws. First are the methodological issues involved in the development or adaptation of the measure used. As was discussed, modifications of the IPV are all too often used without a thorough evaluation as to the quality of the revised measure (e.g., on an independent sample). Most past researchers have computed alpha, but do not go beyond that to investigate the validity of the measure or any type of reliability beyond internal consistency. Second, as was discussed with respect to the IPV, the definition of polychronicity that has been used by researchers often has not matched the measure of polychronicity they have used. Third, the items themselves have thus far been problematic.

Because the IPV was based largely on the PAI, the format of the questions remained very similar. The items themselves are either very broad (e.g., "we like to juggle several activities at the same time," "we prefer to do one thing at a time") or very specific, referring to a person who has 'projects' or 'assignments' to complete rather than different types of tasks or tasks in general (e.g., "we would rather complete an entire project every day than complete parts of several projects," "we seldom like to work on more than a single task or assignment at the same time"). In addition, every preference item is perhaps most appropriate for measuring someone at a medium level of polychronicity. There are no items representing the more extreme ends of the potential spectrum of polychronicity (e.g., I am bored unless I have a ton of things going on at

once; I become overwhelmed when I try to do more than one task at a time). Because there is no a priori basis for estimating how varied individuals are likely to be with respect to polychronicity (e.g., Ferguson, 1949), I believe it would be better to attempt to include items representing a greater amount of the potential distribution.

Finally and most importantly, past measures of polychronicity have been limited by the lack of a clearly stated definition of polychronicity. The present paper has proposed just such a definition, and as a result of the various issues with previous measures of polychronicity and the need to develop a measure fitting this definition, I will now propose and describe the development of a new measure of polychronicity.

Development of a New Measure of Polychronicity

Because of the past issues with the definition and measurement of polychronicity, the relationship between polychronicity and multitasking performance outcomes remains unclear. The review of definitional and measurement issues included here makes apparent that research improvement in these areas is needed, and in fact there are clear avenues for improvement. A clarified definition of polychronicity included here should allow for not only a more focused explication of the construct itself and thus its hypothesized relationships with other variables; it will also serve as a solid foundation for the development and validation of a new measure of polychronicity. To reiterate, the definition of polychronicity used herein is *an individual's preference for shifting attention among ongoing tasks, rather than focusing on one task until completion and then switching to another task.*

The present study will first develop a new measure of polychronicity, then test a model of non-cognitive predictors of multitasking that includes anxiety as a mediator.

Hypotheses

As has been discussed, the present study addresses two main issues. The first is a consistent methodological issue in the literature on non-cognitive predictors of multitasking performance. The second is the development of an improved definition and measure of polychronicity, a variable with potential for predicting multitasking performance. To this end, the present study will first outline the development a new measure of polychronicity (hereafter referred to as POLY), and will then test a number of hypotheses regarding the predictive validity of polychronicity and other non-cognitive variables.

Measure Development Hypotheses

An essential part of measure development is establishing conceptual and empirical distinctiveness, namely that a measure is conceptually and empirically distinct from measures of similar constructs, as well as from previous measures of the same construct.

The Big Five factors of personality are routinely measured and used as non-cognitive variables predicting job performance outcomes. Two of the Big Five factors were thought to be particularly relevant to polychronicity. First, extraversion was expected to be positively related to polychronicity due to the fact that individuals at higher levels of each of these constructs would tend to be drawn toward activities providing a high level of stimulation. Conversely, neuroticism was expected to be negatively related to polychronicity because people at higher levels of neuroticism tend to avoid highly stimulating activities such as multitasking, and as such would be more likely to prefer activities *not* involving multitasking. Thus, I hypothesized that

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H1a: IPIP Extraversion will be positively correlated with POLY.

H1b: IPIP Neuroticism will be negatively correlated with POLY.

Need for cognition is a construct reflecting one's preference for engaging in activities requiring thought (Cacioppo & Petty, 1982). Though polychronicity and need for cognition seem to be similar due to the fact that they are both preferences that would potentially lead a person toward more complex tasks, it is argued here that they are conceptually distinct because they refer to different types of complexity. Polychronicity refers to complexity in terms of the number of tasks, and need for cognition refers to complexity in terms of cognitive processing. It should be clear that one must not prefer to engage in multiple tasks in order to prefer engaging in high levels of cognition, and vice versa. For example, the combination of a number of simple, thoughtless tasks would be much less cognitively engaging than the performance of only one highly complex task. Thus,

H2: A measure of need for cognition will show a low correlation (less than .3) with POLY.

Finally, though the IPV and PAI both purport to measure polychronicity, the new definition and measure of polychronicity proposed here are more specific than past definitions and thus the measure will have content that is tailored more closely to this specific definition. Thus,

H3a: The IPV and the PAI will be positively correlated with the POLY.

H3b: The POLY will be more highly correlated with multitasking performance than either the PAI or the IPV.

In order to provide support for the theoretical underpinnings and practical uses of a measure of polychronicity, it is important to establish that it predicts such outcomes as enjoyment of multitasking, excitement (good arousal) during multitasking, and the choice to multitask in the future. Thus,

> H4a: POLY will be positively correlated with enjoyment of the multitasking simulation.

> H4b: POLY will be positively correlated with excitement (good arousal) during the multitasking simulation.

> H4c: POLY will be positively correlated with the number of tasks participants wish to perform at once, given a choice.

Predictive Hypotheses

To address issues with previous research, the current study manipulates, measures, and tests anxiety (bad arousal) as a mediator of the relationship between the non-cognitive variables extraversion, neuroticism, Type A Behavior Pattern, polychronicity, and multitasking performance.

Thus, it is expected that:

> H5a: Scores on measures of all non-cognitive predictors will be related to multitasking performance.

> H5b: Scores on measures of all non-cognitive predictors will be related to ratings of anxiety during the multitasking simulation.

> H5c: Ratings of anxiety during the multitasking simulation will be negatively related to multitasking performance.

H5d: The relationship between scores on measures of all non-cognitive predictors and multitasking performance will be reduced by controlling for anxiety. In other words, anxiety will mediate these relationships (see Figure 1 for an illustration of the proposed mediated relationships).

Finally, because the practical importance of POLY is dependent upon its unique contribution to the prediction of multitasking performance over and above other constructs and because POLY is more specific to multitasking, it was expected that polychronicity would predict multitasking performance over and above cognitive ability and other non-cognitive variables. Thus,

H6: Scores on the POLY will predict performance at multitasking over and above cognitive ability, extraversion, neuroticism, and Type A Behavior Pattern.

METHOD

This study consisted of 2 phases. The first was the measure development of POLY, including pilot testing. The second was data collection for measure evaluation and hypothesis testing purposes, involving all non-cognitive measures and the multitasking simulation.

Phase 1: Measure Development

Item Generation

The first step in the development of POLY was to have subject matter experts (SMEs) generate potential items. Two SMEs were selected from the Skilled Performance Laboratory (SPL) at Michigan State University and two SMEs were selected from Navy Personnel Research Studies and Technology (NPRST). These four SMEs were selected due to their familiarity with the construct of multitasking. As a result, they were thought

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to have been better able to distinguish the concepts included in the new definition of polychronicity (shifting attention) from related, but distinct concepts (attention sharing). Unfortunately, the SMEs from NPRST expressed their inability to perform the item generation task. As such, two additional SMEs were recruited from the SPL and one additional SME was recruited from among colleagues familiar with the concepts of multitasking and polychronicity. Though some of the SMEs who actually completed the task were different from those which had originally been intended, each member of the final group of 5 SMEs was well-versed in the constructs of interest, and thus their qualifications as SMEs were not in doubt.

SMEs were provided with thorough item-generation instructions including the new definition of polychronicity and an explanation of how it could be differentiated from past definitions or similar constructs. The instructions, which are included in Appendix A, also included item writing guidelines. SMEs were asked to create items that reflected the entire potential continuum of polychronicity, from very low to very high. An attempt was made to create a large amount of potential items, in order to sample adequately from the possible domain (Clark & Watson, 1995). In the end, SMEs created a total of 149 potential items.

Item selection

After compiling the list of potential items, those with nearly identical content were trimmed. A total of 12 items were found to be nearly identical to other items, and were deleted or combined (see Appendix B for the 137 non-identical items). I and an additional SME who had not been a member of the original set of SMEs then rated the remaining items on clarity (1 = very unclear, 5 = very clear), construct relevance (1 =

very irrelevant, 5 = very relevant), and level of polychronicity (1 = very low or monochronic, 5 = very high or polychronic). Items that were found to be unclear or irrelevant (i.e., a rating by either rater of less than 3 on a 1-5 scale for clarity or relevance) were discarded. This process resulted in the deletion of 111 items. It should be noted that due to the desire for a measure of reasonable length, the criteria for deletion of items were quite stringent resulting in the desired outcome of the deletion of a large number of items. Throughout the process, I maintained an awareness of the item content for items that were deleted and items that were kept, and ensured that the deletion of items was not resulting in a deficient measure. Had this occurred, I would have chosen to reword items instead of deleting them. To ensure that items were still representative of the entire continuum of polychronicity, ratings regarding the level of polychronicity each item reflected were examined. The mean rating for all items was exactly at the midpoint of the scale ($M = 3.0$) and the items were spread out rather broadly ($SD = 1.46$), supporting the notion that the underlying continuum was well-represented. (see Figure 2 for a histogram). The pilot POLY measure thus consisted of 26 items (see Appendix C).

Pilot Testing

The POLY was pilot tested using a sample of 130 undergraduate students at Michigan State University. Due to technical difficulties or nonresponse, data from 19 participants was discarded resulting in a final sample size of 111. Because the POLY will primarily be used on college-age participants due to its likely future use in laboratory research on multitasking, this is an appropriate group to use for pilot testing (Dawis, 1987). It is important to note, however, that in order to establish the psychometric

properties of POLY in various groups, in the future a more diverse sample will be required.

Participants signed up for the experiment through the psychology department's subject pool, and participation was entirely online. Pilot testing served three purposes. The first was to ensure the readability of the measure and to clear up any confusing items or directions, the second was to eliminate items that psychometrically were not functioning properly, and the third was to examine the factor structure of the measure. Respondents were asked to indicate to what extent they agreed or disagreed with each of the 26 statements (items) in the measure. The scale was a 1-5 Likert-type scale ranging from Strongly Disagree to Strongly Agree.

In addition to the POLY, participants were given one item asking whether any items in the measure were repetitive and one item asking whether any items were unclear. They were asked to indicate "yes" or "no" and to give examples if their answer was "yes". Participants were also asked a third open-ended question allowing them to provide comments or input into the development of the measure. To address the first purpose of pilot testing, an analysis of the qualitative responses participants provided was performed. Of the 108 participants who provided responses for the clarity question (rather than leaving it blank), 105 respondents indicated that none of the questions were unclear. Among the three participants who indicated that there were unclear items, each participant indicated only one item and there was no agreement as to which items were unclear (i.e., each participant indicated that a different item was unclear). As a result, I reviewed each of the three items that had been mentioned. Because the lack of agreement among the participants did not serve as strong evidence that the items were unclear and

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because upon looking at the items they did not appear unclear to me, I chose to keep the items in the measure.

Of the 117 respondents who provided an answer to the repetitiveness question, 86 (74%) indicated that at least some of the items were repetitive. Of these, seven participants provided specific item numbers, while the remaining 79 simply indicated that the survey contained repetitive items. Though the question was intended to produce answers that contained pairs of items participants found to be redundant (e.g., items 1 and 3), the instructions do not appear to have been clear enough because participants who provided item numbers simply listed items. Because this provided little evidence as to which item pairs were actually redundant, I chose to look simply at which items were mentioned most often as being repetitive. The most often-mentioned items (items 1 and 4) were mentioned by a total of 5 participants. Again, the consensus did not appear overwhelming and my examination of the items did not provide conclusive evidence that they were redundant, so I chose not to delete them. Though many participants did indicate that items in the measure were repetitive, I expected this to occur because the measure was in fact designed to tap a narrow construct.

Of those participants who provided a response to the open-ended "comments" question, 11 indicated that a less repetitive measure would be an improvement. Six participants mentioned that they had difficulty answering some of the questions because their preference for multitasking differed in different contexts (e.g., at school and at home). This is an interesting perspective, and one that I may pursue in future research, but is beyond the scope of this project for creating a general measure. Finally, three mentioned that asking questions about specific rather than general tasks (e.g., "checking

email" versus "performing tasks") made the questions easier to answer. All open-ended qualitative responses fell into one of these three categories. Because I was already aware of each of these issues, I took the comments into consideration but took no action as a result of them.

To address the second purpose of pilot testing, item-total correlations were computed for all items (see Table 1 for correlations, means, and SDs). Based on a predetermined cutoff value, items with a corrected item-total correlation less than .40 (items 5(r), 14(r), 17(r), 20, 22, 24, and 25) were flagged as potential items to delete. Alpha was computed, and was quite high α = .88. Alpha if item deleted statistics showed that the deletion of the following items would increase alpha: 5(r), 14(r), 17(r), 20, 25. As a result of these analyses, I decided to consider deleting items 5, 14, 17, 20, and 25 from the measure. An examination of the items indicated that all of these items were either worded rather extremely (e.g., "While I am driving, I prefer to have the radio off and everyone quiet so I can concentrate solely on driving.") or reflected such common behaviors for college students that NOT agreeing with an item would be rather extreme (e.g., I like to talk on my cell phone while driving). The average means of the items in these groups supported this conclusion; being 3.94 for the high extreme items and 2.24 for the low extreme items (mean for all other items excluding these items was 3.02). Because they were in fact so extreme, I decided to delete these items because I felt that they potentially reflected some other construct rather than a normal preference for task switching. Alpha was recomputed, and was higher α = .90 which was acceptable given the previously established .80 goal for alpha (see Lance, Butts, & Michels, 2006, for an examination of the typically accepted .7 cutoff "myth" for reliability).

To address the second purpose of pilot testing, I conducted a principal axis exploratory factor analysis to examine the factor structure of the POLY. The items formed a single factor, as indicated by the scree plot indicating a clear break after the first factor (see Figure 3) and one large eigenvalue explaining 35.52% of the variance (see Table 2). Though item loadings for items 6, 8, 9, 10, 18, 22, 24, and 26 were below Nunnally's (1978) recommended cutoff of .45, after examining the content of these items I chose to keep items 8, 9, 10, and 26 because I felt that deleting these items would result in a measure that was construct deficient. Without those items, the measure would have too few items asking about specific tasks (e.g., using a computer). In addition, the item loadings for those items were very close to the cutoff (see Table 3). Thus, only items 6, 18, 22, and 24 were deleted. Another exploratory principal axis factor analysis was performed excluding these items, and again a one factor solution appeared suitable, as evidenced by the scree plot and one large eigenvalue explaining 40.88% of the variance (see Figure 4 and Tables 4 and 5).

During the measure editing process, I noticed that four of the items appeared to need re-wording. These items contained the phrase "at the same time," which was not intended to be the focus of the measure because it reflects attention sharing rather than switching. Thus, these items were reworded to reflect switching or shifting among tasks. Apart from the editing of those four items, the measure content appeared satisfactory after the deletion of the items. See Appendix D for all pilot POLY items and the editing/deletion that was performed as a result of pilot testing.

Finally, because it was an important goal to maintain representativeness of the entire continuum of polychronicity, an examination of item means for the items

remaining after measure editing was performed to ensure that they were spread out across the continuum. To examine this, I computed the mean and standard deviation of the item means for those items remaining in the edited 17-item measure. The mean was very close to the midpoint of the scale (3.02) and the standard deviation (.36) supported the contention that the items were still representing the entire underlying continuum (see Figure 5 for a histogram of item means). Thus, the 17-item version of the measure was used for the main study.

Phase 2: Data Collection

Sample

Participants were undergraduates at Michigan State University who received course credit in their psychology courses in exchange for participation. The total sample size was 159, though some participants were missing data from certain parts of the experiment (e.g., the pretest) and were thus excluded from analyses including those variables. The sample size for analyses performed ranged from 127 to 152, which is acceptable given the a priori power analysis. Regarding the power analysis, the effect size that can be detected at a power of .80 with a given sample size was performed using the G*Power program (Faul, Erdfelder, Lang, & Buchner, in press). More specifically, I focused on the statistical analysis that is least sensitive to sample size, which is the test of R^2 change for the incremental validity of POLY. The power analysis revealed that an effect of .053 could be detected at a power of .80 with a sample size of 150. This .053 effect is considered small-to-medium in magnitude (.02 being small and .15 being medium by Cohen's standards), which was judged to be an acceptable level of sensitivity for this analysis.

Procedure

Participants signed up for the experiment online, at which time they took the POLY online as a "pretest". All participants completed a consent form (see Appendix E) before participating in the experiment. Following the POLY measure, participants took a 5-item version of a measure of face validity (Smither et al., 1993; see Appendix F). The measure included the definition of polychronicity proposed in this paper, followed by statements such as "The actual content of the survey was clearly related to polychronicity". Ratings were made on a 5-point, Likert-type scale (strongly disagree-strongly agree). In addition, participants were asked to indicate whether the items were unclear or repetitive, also on a 5-point, Likert-type scale. Approximately one week later, participants completed the remainder of the experiment in a laboratory setting in groups of 5-8. The experiment occurred in two main sections. During the first section, participants completed measures of all cognitive and non-cognitive variables involved in the study. During the second section, participants learned and performed a multitasking simulation.

Section 1: Measures

Participants first completed a *matrix reasoning* measure of cognitive ability (see Appendix G for an example item) on paper. The matrix reasoning measure was chosen because of its brevity and its use in previous multitasking research, and its demonstrated relationship with multitasking performance (e.g., Oswald, Hambrick, and Jones, 2007). In this measure, items consist of 3 × 3 matrices in which each cell contains a pattern except the one in the lower right-hand corner. Participants must choose from eight

potential alternatives a pattern that makes the most sense in the missing ninth cell. Eight minutes were allowed for 14 items.

Next participants completed a number of measures online, beginning with a measure of demographic characteristics (see Appendix H for all online measures). Next, participants completed the 17-item version of the POLY. Participants then completed two 10-item measures from the International Personality Item Pool (IPIP) to measure Neuroticism and Extraversion. Each item contained a statement such as "I am the life of the party" or "I often feel blue." Participants rated how well each item describes them, using a 5-point scale. Participants then took the 18-item short form of the Need for Cognition scale (Cacioppo, Petty, & Kao, 1984). The measure consisted of a series of statements, such as "I would prefer complex to simple problems." Participants rated how well each item describes them using the same scale as above. Next participants completed both past measures of polychronicity, the PAI and the IPV. Finally, participants completed a measure of Type A Behavior Pattern used in previous multitasking research. The 21-item version of the Jenkins Activity Survey (student version; Glass, 1977, Jenkins, Zyzanski, & Rosenman, 1971) was used. This measure consisted of a number of questions such as "How often are you late for appointments," to which the participant indicated his or her answer from a list of potential choices.

Section 2: Multitasking Simulation

Following the administration of the measures, participants began the multitasking simulation. The multitasking simulation used was SynWin, a "synthetic" work task which contains four component tasks that are presented simultaneously (see Figure 6). The tasks are *memory search, arithmetic, visual monitoring,* and *auditory monitoring.* In

the memory search task, a set of letters is presented for a short time and then covered. Subsequently a letter is presented and participants identify whether the letter was a part of the previously shown set. Participants may click the area where the list appeared to reveal the letter set again, but doing so carries a point penalty. In the arithmetic task, participants add 2-digit or 3-digit numbers. This task is performed at the participant's own pace. In the visual monitoring task, a needle moves from right to left across a fuel-like gauge. Participants must click on the gauge to reset the needle before it reaches zero. More points are given for the needle being as close to zero as possible and points are lost proportional to the length of time the needle stays at zero. In the auditory monitoring task, participants must respond to a higher-pitch target tone and to ignore a lower-pitch distracter tone. Participants performed the multitasking simulation for two 10-minute blocks.

Importantly, after completing the multitasking simulation participants were given measures of both positive (excitement) and negative (anxiety) arousal during the simulation, as well as their enjoyment of the multitasking simulation (see Appendix I for all online posttests). As an important manipulation check, anxiety experienced during the simulation was examined. As can be seen in Figure 7, the simulation was anxiety-producing enough to result in an approximately normal distribution of anxiety scores, which is an improvement over past studies because the anxiety scores do not show the previously common floor effects. After completing these measures, participants were asked to imagine that the researchers needed four more minutes of performance data from them, but they were free to choose how many tasks of SynWin they would perform at once. Participants were asked to indicate whether they would like to perform one, two,

three, or all four tasks at a time. They were then asked an open-ended question regarding why they chose the number of tasks they chose. Participants did not actually have to perform these tasks, and were then thanked for their participation and excused.

RESULTS

The analyses also consisted of two phases. The first was measure evaluation, and the second was the testing of the relationships between non-cognitive predictors and multitasking performance.

Phase 1: Measure Evaluation

Reliability

Internal consistency (alpha) reliabilities, means, standard deviations, and intercorrelations for all measures can be seen in Table 6. Of special interest is alpha for the 17-item POLY, which was $\alpha = .90$. Given the .80 cutoff established in the proposal, this was considered satisfactory. In order to establish that items were still functioning as expected, item-remainder correlations were also examined (see Table 7). Items 6, 7, and 8 had quite low item-remainder correlations (all under .35). After once again examining the content of the items in the measure, I concluded that the removal of these items would not aversely affect content validity because similar content was reflected in other items. Thus, they were excluded from the measure for further analyses. By contrast, items 2 and 18 also had low item-remainder correlations (.38 and .39, respectively) but were kept because I concluded that deleting them would have resulted in construct deficiency. After deleting items 6, 7, and 8, alpha for the 14-item measure was slightly higher at $\alpha = .91$. Test-retest reliability, as estimated by the correlation between scores on the POLY at Time 1 (online sign-up) and scores on the POLY at Time 2 (lab session) was $r = .83$.

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Because a cutoff of .70 or higher was established in the proposal, this was considered satisfactory. One other measure deserves mention at this point due to its failure to function as expected. Contrary to the satisfactory reliabilities found for the Type A Behavior Pattern measure, this study found a very low alpha reliability (α = .57) and extremely low or negative item-total correlations (see Table 8). A variety of scoring methods (e.g., continuous, dichotomous) and the dropping of many combinations of items were attempted in an exploratory fashion order to improve the psychometric qualities of the measure, but none of these efforts resulted in substantial improvements. Thus, the measure was dropped from further analyses.

Validity

Face and Content Validity

Ratings of face validity were averaged. Though a cutoff of 4.0 (corresponding to "agree") was determined to be the cutoff for acceptability, the mean face validity rating across items was only 3.5. Despite the fact that this was slightly lower than the established cutoff, it is still higher than the "neutral" point on the scale, indicating some support for the face validity of the scale. Content validity was assessed by having five SMEs rate the extent to which the POLY reflects the construct of polychronicity in its entirety (see Appendix N). The mean content validity rating was 4.53, which exceeded the predetermined cutoff of 4.0. As an index of interrater agreement, I computed ICC(1), which indicates the amount of variance in ratings that can be attributed to the fact that ratings were made by different raters (McGraw & Wong, 1996). The ICC(1) for content validity ratings was .85 . Because ICC values are comparable to reliability coefficients, an ICC(1) of .7 or greater was set as the cutoff. Thus, there was substantial enough

agreement to merit combining the ratings (LeBreton, Burgess, Kaiser, Atchley, & James, 2003).

Convergent and Discriminant Validity

To test H1a, the bivariate correlation between the measure of extraversion and the POLY was calculated (see Table 6). Before the study, it was determined that a positive correlation would provide support for H1a. The correlation of $r = .14$, $p = .09$ between the two measures failed to support this hypothesis. To test H1b, the bivariate correlation between neuroticism and the POLY was calculated. The correlation of $r = -.11$, $p = .19$ also failed to support this hypothesis. Both correlations were in the correct direction, however, and had the sample size been larger these correlations may have become significant. To test H2, the bivariate correlation between need for cognition and the POLY was calculated. The correlation of $r = .04$, $p = .64$ provided support for this hypothesis because it was not in the range of practical significance, set at $|r| = .30$. To test H3a and H3b, the bivariate correlations among the PAI, the IPV, the POLY, and multitasking performance were calculated. A moderate, positive correlation between the POLY and both the IPV and PAI would have provided support for H3a. However, the correlations among the polychronicity measures were higher than expected, $r = .73$, $p < .05$ for the PAI and $r = .85$, $p < .05$ for the IPV. This result casts some doubt on the uniqueness of the POLY from previous measures, however measures can correlate highly and still maintain different relationships with criteria.

A higher correlation between the POLY and multitasking performance than between either the IPV or the PAI and multitasking performance would have provided support for H3b. Contrary to the hypothesis, the PAI was significantly correlated with

both blocks of multitasking performance, $r = .21$ and $r = .22$, both $p < .05$ but neither the IPV nor the POLY was significantly correlated with multitasking performance in either block, $r = .08$ and $r = .04$ for the IPV and $r = .11$ and $r = .09$ for the POLY, $p > .05$ for all. Because the correlations between the IPV and multitasking performance and the POLY and multitasking performance were not significant, it is not possible to compare their relative size. However, the fact that the PAI did show a significant correlation with multitasking performance at least partially contradicts H3b.

Criterion-related validity

To test H4a, enjoyment of the multitasking simulation was included as the criterion in a simple linear regression with POLY as the predictor. In support of H4a, the POLY was a significant predictor of enjoyment, standardized $\beta = .28$, $F(1,147) = 12.24$, $p < .05$, $R^2 = .08$. To test H4b, a simple linear regression was performed with excitement during the multitasking simulation as the criterion and POLY as the predictor. The analysis failed to provide evidence that the POLY was a significant predictor, standardized $\beta = .04$, $F(1,146) = .24$, $p = .64$, $R^2 = .00$ and thus H4b was not supported. To test H4c, the number of tasks participants choose to perform during the "extra" 4-minute performance session was included as the criterion in a simple linear regression with POLY as the predictor. In support of the hypothesis, the POLY was a significant predictor of the number of tasks chosen, standardized $\beta = .17$, $F(1,148) = 4.40$, $p < .05$, $R^2 = .03$.

Phase 2: Non-cognitive Predictors and Multitasking Performance

Mediation Tests

The first step in testing the mediational hypotheses is to establish that each of the non-cognitive measures is associated with multitasking performance. However, as was discussed earlier, the POLY was not found to be significantly related to multitasking performance in either performance block. In addition, extraversion was not found to relate to multitasking performance, $r = .08$ and $r = .05$, $p > .05$ for both. The only non-cognitive measure found to relate significantly to multitasking performance was neuroticism. As such, neuroticism was the only measure for which the mediational analyses were performed. Due to the relative simplicity of this analysis as compared to the analysis that had been proposed when all non-cognitive variables were to be tested, I chose to do the mediational analysis in regression rather than in SEM, as SEM provided no additional benefit in this case.

As such, three simple linear regressions were performed to test whether neuroticism predicted multitasking performance, and whether this relationship was mediated by anxiety experienced during the multitasking simulation. As expected, neuroticism was found to be a significant predictor of multitasking performance, standardized $\beta = -.23$, $F(1,149) = 8.18$, $p = .01$, $R^2 = .05$ and of state anxiety, standardized $\beta = -.24$, $F(1,146) = 9.11$, $p = .00$, $R^2 = .06$. In support of H1c, anxiety was found to be a significant predictor of multitasking performance, standardized $\beta = -.27$, $F(1,148) = 11.68$, $p = .00$, $R^2 = .07$. All relationships were in the expected directions. To test whether the mediation was partial or complete, a hierarchical regression was performed with multitasking performance as the criterion, anxiety entered in Step 1, and neuroticism in Step 2. After controlling for state anxiety, neuroticism was a reduced but still significant predictor of multitasking performance, indicating partial mediation,

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standardized $\beta = -.18$, $F(2,146) = 8.57$, $p = .00$, $R^2 = .11$ for the full model, R^2 change = .03 for Step 2, $p = .03$.

Incremental Validity Test

Finally, a three-step hierarchical regression analysis was proposed to evaluate the incremental validity of POLY over and above other variables. Because POLY was not significantly related to multitasking performance, however, this hypothesis cannot be supported and the performance of these analyses is unnecessary.

DISCUSSION

The purpose of the present study was twofold. The first goal was to improve upon the methodology used to explore the relationships between non-cognitive variables and multitasking performance. To this end, the paper reviewed past research on non-cognitive predictors of multitasking performance and highlighted key issues relevant to anxiety. To address these issues, anxiety was separated conceptually from arousal and was induced, measured, and tested as a mediator of the relationship between non-cognitive variables and multitasking performance. The second goal was to develop a new measure of polychronicity, a non-cognitive variable that shows promise as a predictor of multitasking. As such, I reviewed past research on polychronicity and highlighted definitional and measurement issues. To address these issues, I put forth a new definition of polychronicity and developed a new measure of polychronicity (the POLY). The new measure was then evaluated with respect to many aspects of reliability and validity.

I will first review the results of the study related to the development of the POLY, and will then move to a discussion of the study's value in the area of predicting multitasking performance. This will be followed by a section describing the limitations

of the present study and directions for future research, and I will conclude by summarizing the contributions of the present paper.

Measure Development

The present study described the construction of a measure of polychronicity that is based on a new definition of polychronicity and that shows evidence of reliability and validity. With respect to reliability, the POLY was found to exhibit high test-retest and internal consistency reliability. Because it was designed to tap a very narrow construct, high levels of reliability (e.g., .90) are appropriate, and in fact are essential because they provide evidence that the measure is operating without a great deal of random error variance. In addition, the high test-retest reliability provides some evidence that the POLY measures a stable characteristic. With respect to validity, the POLY was tested in a number of ways. First, the content validity of the POLY was rated by experts and found to be satisfactory. The high ratings received by the POLY with respect to content validity reflect the fact that the items within the measure each tap the construct of polychronicity (and nothing else), and that as a set, the items reflect the entire content domain of polychronicity. This is particularly important with respect to the POLY because past measures of polychronicity appeared to be construct contaminated due to the inclusion of items tapping behavior and preference.

Though face validity was slightly lower than expected, the mean face validity rating was still above the midpoint of the scale, indicating better than neutral support for the face validity of the measure. With respect to convergent and discriminant validity, the POLY showed mixed but promising evidence of its uniqueness from related constructs. POLY was unrelated to a measure of Need for Cognition, a measure it was

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expected not to relate to. In addition, though the correlations between the POLY and measures of extraversion and neuroticism did not reach the level of significance in the present study, the relationships were in the correct directions. Though it is impossible to make conclusions on the basis of non significant relationships, the trends lead to the possibility that in a study with a greater sample size, these relationships might in fact become significant.

Next, the POLY showed high correlations with past measures of polychronicity, the PAI and IPV. Because the correlations were slightly higher than was anticipated, this raises some doubt as to whether the POLY is independent enough from these past measures to provide better prediction of outcomes. Because the three measures were filled out in the same survey administration in the same survey format, however, it is possible that the correlations among the measures were artificially slightly inflated. In fact, the POLY participants filled out during the pretest showed somewhat lower correlations with the PAI, $r = .62, p < .05$ and the IPV, $r = .76, p < .05$. This evidence lends support to the previous explanation and to the discriminability of POLY from past measures. In addition, although the POLY is highly related to past measures, it was specifically designed to measure polychronicity as defined in this paper, which supports its use over the other two measures in future research if the currently proposed definition is used.

With respect to criterion-related validity, this study did not find support for the hypothesis that POLY would predict multitasking performance. There are many reasons why this might have occurred, and these will be discussed in detail in the limitations section to follow. Though the POLY did not predict performance or excitement during

the multitasking simulation, it did significantly predict both enjoyment of the simulation and the number of tasks participants would have chosen to perform, had they been given the chance. After they chose how many tasks they would like to perform if the experimenters had asked them to perform one more SynWin block, participants were asked why they chose the amount of tasks they chose. A purely explorative investigation into these responses provides some interesting information. For participants who indicated that they would like to perform four tasks (the maximum number of tasks, n = 69), the most frequently reported answers were that doing so would be *challenging* (n = 12), that they were simply *comfortable* (n = 11) doing four tasks at once, or that any fewer would be *boring* (n = 10). This data suggests that perhaps highly polychronic people might derive more personal fulfillment out of jobs requiring higher levels of multitasking, would be more satisfied with them, and would be left unsatisfied with jobs that did not allow them to multitask.

This finding has potential practical significance with respect to the POLY because it speaks to the potential usefulness of POLY as a placement tool for jobs requiring high levels of multitasking, such as air traffic controller. An individual high in polychronicity, because he or she might enjoy the multitasking component more than an individual low in polychronicity, might find these jobs more rewarding on the whole. Though it is purely speculative, one might infer that these individuals would also be less likely to burn out or turn over from these jobs due to their general enjoyment of them. Of course the findings in this study with respect to such satisfaction-related outcomes are only preliminary, however the knowledge that such relationships are possible should prove useful in future research, which will be discussed later. Taken together, the measure

evaluation findings indicate that the POLY shows clear evidence of reliability, some evidence of various types of validity, and promise as a predictor of multitasking-related outcomes.

Predicting Multitasking Performance

Though the POLY and other non-cognitive measures were not found to relate to multitasking performance, this study does provide two relevant findings with respect to the prediction of multitasking performance. First and foremost, the simulation produced anxiety in participants, and the anxiety they experienced during the multitasking simulation was a significant predictor of multitasking performance. This is an important finding because past researchers have often discussed the potential role of anxiety in reducing performance, but have not directly measured anxiety. Second is the finding that neuroticism is a significant predictor of multitasking performance (mediated by anxiety). Though past researchers (Szymura & Necka, 1998; Szymura & Wodnieka, 2003) found some preliminary evidence that neuroticism predicted multitasking performance, their results were mixed and somewhat inconclusive. Thus, the present study is the first to find a clear relationship between neuroticism and multitasking performance.

The significance of these findings extends beyond the variables themselves. The finding that anxiety and neuroticism significantly predict multitasking performance provides evidence to suggest that researchers should continue to investigate non-cognitive predictors of multitasking performance. Because of the relative failure of researchers to link non-cognitive predictors with multitasking performance, some researchers (e.g., Bühner, König, Pick, & Krumm, 2006) have suggested that perhaps

multitasking researchers should abandon non-cognitive predictors. The present results, however, would suggest that doing so might be premature.

Limitations and Future Directions

The present study possessed some important limitations that should be addressed by future research. First, the sample used in the present study was restricted to college undergraduates, a sample whose generalizability to the population at large is questionable. With respect to the generalizability of the sample, the present sample of college undergraduates possesses two main important differences from other samples. First is the likely motivation of the participants. Though motivation was not measured, it is probably safe to assume that participants on the whole were not highly motivated to perform the task to the best of their ability because it had no bearing on any future outcome for them. Study participants were aware that their performance on the SynWin task would have no impact on the amount of credit they would receive, and therefore their motivation to perform might have been low despite encouragement from the experimenters to try hard and get the highest score possible. Low motivation may have resulted in lowered performance scores overall and as such, reduced variance. This may have attenuated the correlations between multitasking performance and other variables in the study.

The second limitation of the present sample is the age of the participants. Research has shown that multitasking ability decreases with age (e.g., Salthouse, Hambrick, Lukas, & Dell, 1996), and as such the results of multitasking studies performed with participants of college age are likely not to generalize well to older populations. In fact, polychronicity scores may fall with age due to the fact that

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multitasking becomes more difficult with age. Though the present sample was reasonable for this study due to the basic nature of the research questions and the availability of the sample, future studies should attempt to replicate the reliability and validity findings of this study and to address its weaknesses by using a more diverse sample, particularly in terms of age, motivation, and work experience.

The final limitation with respect to the sample is its size. Though an a priori power analysis guided the sample size used in this research, it appears that the study possessed insufficient power to detect the relatively small relationships in the convergent/discriminant analyses. As a result, future researchers should gather larger samples in order to have sufficient power for these tests.

In addition to sampling limitations, the present study also possessed limitations with respect to the multitasking simulation utilized. Though the simulation does provide many benefits that were discussed earlier in the paper (e.g., the manipulability of task characteristics), the task possesses limitations relevant to both the external and internal validity of the study. First, the simulation possesses limited generalizability to real-world multitasking situations. The tasks within the multitasking simulation are designed so that they require no previous knowledge (e.g., reading ability) and so that they are very easily learned. By contrast, many tasks that are performed in real workplaces require both general and task-specific knowledge. Having to access such knowledge while multitasking might alter the processes used or the level of challenge, and thus limit the applicability of these results to real multitasking situations.

The simulation also possesses limited external validity as a result of its general appearance. Though memorizing, performing arithmetic, and monitoring are perhaps

similar to the types of tasks a person might perform in some roles (e.g., receptionist), the tasks all appear on the same computer screen, and the tasks appear more like a game than a workplace situation. Other multitasking simulations (e.g., SIMKAP, discussed earlier) appear much more similar to real-world tasks, and thus may be more generalizable than the SynWin simulation.

In addition to concerns about generalizability, the multitasking simulation also possesses limitations with respect to the internal validity of this study. As was alluded to in the introduction to this paper, multitasking researchers lack an organizing framework in which to place their multitasking simulations, and thus it is difficult to even determine which characteristics one's multitasking simulation possesses relevant to the predictors used or to other simulations. For example, one's level of polychronicity may be important for multitasking performance, but only for those multitasking situations in which personal volition is a large determinant of performance. In SynWin, three out of four of the tasks in the multitasking simulation are paced by the program rather than the individual. As such, the individual performing the simulation simply has to respond to the switches in task priority (e.g., a new set of letters shows up, the auditory task beeps) rather than driving the task switches him or herself. If task switches were more greatly influenced by the individual, his or her preference might play a larger role in overall performance. Another factor that may play a role in whether a person prefers to multitask may be characteristics of the tasks themselves (e.g., complexity or modality). Someone who prefers to multitask when performing simple tasks may not prefer to multitask when performing complex tasks, and tasks that are of the same modality (e.g., auditory) may make multitasking more difficult or impossible.

Because there is no organizing framework for multitasking situations, however, there is no way to systematically assess the degree to which one's multitasking simulation possesses such characteristics. Thus, it is difficult to know whether the relationships (or lack thereof) one finds are due to certain task characteristics that would be different in other multitasking situations. Additionally, the lack of an organizing framework makes it impossible to systematically compare results across multitasking studies.

In the future, researchers should focus on the development of an organizing framework for multitasking situations. Such a framework would prove useful both with respect to real-world multitasking and laboratory simulations. Being able to differentiate different multitasking situations with respect to their important characteristics (e.g., degree of switching, type of tasks) is essential in order for researchers to make plausible propositions about the relationships between multitasking and other variables, and for researchers to cumulate their results.

A final limitation of this study is its use of self-report measures for all variables except multitasking performance. This is a limitation for two main reasons. First, the relationships in the study may have been inflated due to common method variance. Participants filled out all the measures in the same format (an online survey) with very similar response scales for all measures. This problem is compounded by the fact that the relationships of interest are likely to be small in magnitude, and as such even a small degree of common method variance might result in conclusions that are not merited. Second is the fact that a key measure, anxiety, may not be most appropriately measured using a self-report, perceptual measure as it was in this study. Participants may not be

aware of their actual level of anxiety, or may misattribute excitement or other types of arousal to anxiety because they are in a performance context. To address this issue, future research may benefit from the use of physiological measures of anxiety or arousal (e.g., cortisol levels or heart rate) during multitasking. Researchers might also consider using behavioral, rather than perceptual, measures. For example, to measure choice one might provide participants with a number of choices of tasks to perform while they wait for the experimental session to start. By varying the task choices and collecting data on which participants choose which activities, researchers could assess actual choice behavior rather than choice intentions in a hypothetical situation. Another possibility is measuring career choices with respect to their level of multitasking and determining whether factors like polychronicity predict the choice of a career track high in multitasking (e.g., air traffic controller).

In addition to future directions suggested by limitations in the present study, a final direction for future research is suggested by the results of this study. Instead of focusing on performance at multitasking, polychronicity researchers might benefit instead from a focus on satisfaction- or fulfillment-related outcomes. As discussed earlier, one of the only significant results with respect to polychronicity thus far has been in relation to motivation and commitment rather than performance (Slocombe and Bluedorn, 1999). These outcomes are important because workers who are more satisfied or fulfilled by their jobs, or who experience greater levels of fit, may be more motivated and less likely to burn out or leave the organization. An important consideration here is that ability or intelligence may play a role in the type or degree of multitasking an individual finds rewarding or challenging as well. Future research should integrate polychronicity into

models of person-job and person-organization fit, and examine these results in a satisfaction framework as well as considering the role of ability and its influence on preference.

Conclusion

In sum, the present study made advances toward achieving both the goals set out at the beginning, and it contributes to the literature in four main ways. First, it develops a new definition and measure of a promising construct, polychronicity. Second, it provides examples for how future multitasking researchers might improve their methodology with respect to multitasking simulations and with respect to anxiety. Third, it provides evidence for the utility of neuroticism as a predictor of multitasking performance. Finally, it suggests that polychronicity might be useful as a predictor of non-performance, multitasking-related outcomes. As the need for multitasking at work increases, it is hoped that these contributions will prove valuable to the field of multitasking research.

Figure 1

Hypothesized Mediation of the Relationship between Non-Cognitive Variables and

Multitasking Performance
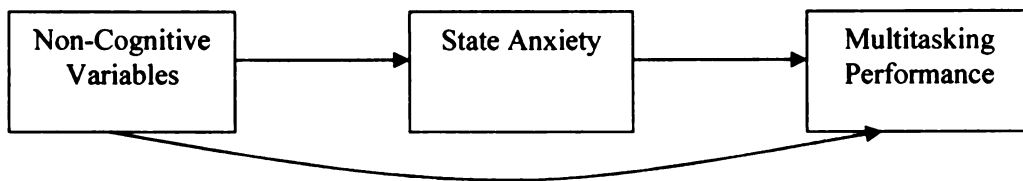
Note. The direction of the relationships is not shown because some are positive and some are negative. The figure is meant to show a generalized representation of the expected relationships.

Appendix A

Item Generation Instructions for SMEs

Introduction

Hello! Thank you for agreeing to serve as an item writer for the key measure in my Masters' thesis project. Your knowledge and expertise in the areas of multitasking and personality and your careful attention to this task are essential to the success of this measure and to my project as a whole.

Purpose of the Project

My Masters' thesis consists of two main parts. The first is the development and validation of a measure of polychronicity, a non-cognitive variable important in the prediction of multitasking. The second is the exploration of the relationships among polychronicity, other cognitive and non-cognitive constructs, and multitasking performance.

You are probably already familiar with polychronicity as it has been previously defined as an individual's preference for multitasking. Though previous definitions and measures of polychronicity exist, a review of the literature suggests that improvements in the definition and measurement of polychronicity are essential in order to make meaningful progress in its exploration. It is my opinion (and the opinion of others, given recent SIOP presentations and discussions with fellow researchers) that polychronicity will become an even more successful predictor of multitasking performance once the definition and measure have been refined.

This step, item generation, is the first of many steps that will be taken toward the development and validation of the measure. After you help us generate a large set of items related to polychronicity, they will be revised and combined to create a pilot measure. The pilot measure will then be tested on an initial sample, and based on data from this sample items will then be edited to create a final version of the measure. Next, data will be collected on this new measure of polychronicity, along with a number of other cognitive and non-cognitive predictors, and a multitasking performance criterion. Analyses on this data set will examine the extent to which polychronicity and other constructs are valid predictors of multitasking performance.

Your task

You are being asked to create items for the new measure based on the revised definition of polychronicity and the item writing guidelines herein.

Definition:
The revised definition of polychronicity is as follows: polychronicity is *an individual's _preference for_ _shifting attention_ among ongoing tasks, rather than focusing on one task until completion and then switching to another task.*

Please take a moment to consider this definition and what types of activities a person high in polychronicity might prefer, based on this definition. Note the emphasis on *shifting one's attention* among tasks and think of activities that might exemplify this. For example, checking one's email intermittently while working on a writing task might fit, but chewing gum while walking might not.

Details of the new measure:
The new measure will be entitled POLY. POLY will be administered by computer and will consist of a number of statements to which a person is asked to indicate his or her level of agreement on a 1-5 scale. The instructions will read as follows:

The following is a survey of normal individual preference. *There are no correct or incorrect answers, so please answer as honestly and accurately as possible.* Your responses will be confidential. Please read each item carefully and respond by indicating how much you agree or disagree with the item, using the response scale provided.

Item generation instructions – please read carefully
Items should be worded as statements of preference, to which study participants can indicate their degree of agreement or disagreement.
Be sure to phrase items as statements (rather than questions) and to use the first person for all items.
There is not a target reading level in mind for the measure, but try to keep it simple by avoiding unnecessarily complex wording or difficult vocabulary.
Please take care to create items that are clear, somewhat brief, and easy to understand.
Please try to focus your items on the idea of preference, leaving out related concepts such as self-efficacy or competence.
An example item that illustrates these guidelines is as follows:
I prefer to combine cooking with other tasks such as watching TV.
This item is easy to understand, refers to tasks people often perform, and reflects a personal *preference* for switching among tasks. Keep in mind that this example is NOT being used as the ideal format for items, nor is it the only format that should be used- it is simply included to illustrate the points discussed above. Your items may not resemble the example at all, while still being excellent representations of the construct and following all the guidelines- this is perfectly acceptable, and in fact it is preferable to have a variety of items rather than many redundant ones.

It is also a goal to have items reflect varying degrees of polychronicity (from very low to very high). For example, some people may be highly disturbed by performing more than one task at a time, while others may need a much higher degree of stimulation in order to be comfortable. Please make an effort to create items that reflect the entire continuum of

polychronicity, from items that reflect preference for a lot of multitasking to items that reflect little to no multitasking.

Please create at least 50 items. If you have any questions, do not hesitate to contact me at oberlan4@msu.edu. Please return your items to me by September 21, 2007 or sooner!

Again, thank you for your help with this task. Your time and efforts are greatly appreciated!

Appendix B

137 Non-identical Items

1. I don't mind situations where I have to switch between several tasks
2. I prefer to work in an environment where I can shift my attention from task to task.
3. I prefer constant change in my life
4. I prefer life to be full of changes that I must deal with a moment-by-moment basis
5. I prefer my life to be filled with several projects
6. I prefer to surround myself with multiple sources of stimulation (e.g., radio, television, conversations).
7. I would like to work in a job where I was constantly shifting from one task to another, like a receptionist.
8. I would prefer to work in an environment where I have to handle many tasks at once.
9. I would prefer to work in an environment where I have to react to changes quickly.
10. I would rather work in a noisy place like a coffee shop than a library
11. I would thrive in a job like stock trader which requires being able to handle many tasks at once
12. Chaotic environments make me nervous
13. I feel anxious in situations that require me to divide my attention
14. I avoid situations in which I have to switch back and forth between tasks
15. I would prefer to work in an environment where I can finish one task before starting the next.
16. Working at a job, like a receptionist, where I was forced to switch between answering phone calls, signing in clients and filing papers, would make me very uncomfortable.
17. My ideal vacation is one where I can do nothing for long stretches of time
18. I like to talk on my cell phone while driving
19. I like to listen to music while I am working on other tasks.
20. I like preparing meals that require juggling several different tasks at the same time
21. Doing my homework is easier for me if I am combining it with another task.
22. I do not mind having a conversation while I am writing a paper.
23. I like to chat online while I do homework or research.
24. I prefer to listen to music while I do my homework.
25. When doing class assignments, I like to switch between subjects periodically.
26. Switching rapidly between email, homework and chatting helps to keep me focused.
27. I do not mind talking to passengers in my car while I am driving.
28. I prefer applying makeup while I'm driving to work.
29. I don't mind being interrupted by a phone call while working on a task
30. I enjoy talking on the phone while I am doing something else.
31. I like to eat breakfast while I'm doing my doing my personal hygiene in the morning.
32. I prefer writing a paper while I watch TV.

33. While watching TV, I usually try to do something else at the same time
34. I like to exercise while watching television.
35. I like to fold my laundry while watching movies/television.
36. I like to read during commercials while watching television.
37. I prefer to do other things like cooking in between tv breaks.
38. I like to listen to books on tape while cleaning my apartment.
39. I prefer hearing the news on the radio/tv while I cook.
40. I like to play games that require me to shift my attention
41. I like to read while I'm walking to class.
42. I prefer surfing the net while I chat with my friends on an instant messaging system.
43. I prefer to check my email intermittently even if I'm simultaneous working on a project report.
44. I prefer to do multiple things online, like chatting on multiple instant message conversations.
45. I frequently check my e-mail while working on my computer
46. When I am using a computer, I like to have multiple windows open so I can work on multiple tasks at once.
47. When I am working on the computer, I prefer to shift my attention between different tasks (e.g., writing a paper, checking email, browsing the internet) instead of working solely on one task.
48. I prefer to combine cooking with other tasks such as cleaning the house.
49. I prefer to combine exercise with listening to music or watching TV.
50. I prefer to combine laundry with other tasks such as preparing for a meeting (or you can say "preparing for a class").
51. I prefer to combine tasks like watering my plants while I'm talking on the cell phone.
52. I prefer to surf the internet while I talk on the cellular phone.
53. I try to have conversations on the phone while working on my computer
54. If I have the opportunity, I will check my e-mail while talking on the phone
55. I prefer to read the newspaper while eating breakfast.
56. I would love to have an extra set of hands so I could play a video game while I work and talk on my cell phone.
57. If I have the opportunity, I will browse the internet during a meeting
58. It does not bother me when I'm interrupted by work emails while I'm completing a project report.
59. When having a conversation with a friend, I often find myself thinking of other things
60. I like to spend several hours reading a book at one sitting
61. I would rather wait until the end of the day to check e-mail than check it periodically throughout
62. If I am watching TV and the telephone rings, I turn off the TV before answering

63. If I had two tasks (e.g., reading a paper and completing a worksheet) that needed completed in the next hour, I would prefer to finish one task completely and then focus on the second one as opposed to switching back and forth between the two.
64. While I am driving, I prefer to have the radio off and everyone quiet so I can concentrate solely on driving.
65. When I have to focus on one task at a time (e.g., reading a paper), I get bored.
66. I find doing only one thing at a time boring.
67. I am a busy person
68. I am an impulsive person
69. I am easily bored
70. I have difficulty concentrating on just one task
71. I have difficulty keeping my mind focused on the task at hand
72. I have difficulty meeting deadlines
73. I am an organized person
74. I have a "one-track" mind
75. I have a high degree of self-control
76. I have difficulty mentally disengaging from a task I have been performing
77. If I am interrupted I have trouble finding my spot again.
78. If I attempt too many things at one time I become distracted.
79. I prefer to work on multiple tasks at once.
80. I am much more engaged in what I am doing if I am able to switch between several different tasks.
81. I do not like to do one thing at a time.
82. I don't like to concentrate on just one task in my life
83. I don't like to focus my attention on one thing at a time.
84. I like to complete tasks as quickly as possible
85. I like to switch my attention from one task to another.
86. I lose interest in what I am doing if I have to focus on the same task for long periods of time without thinking about or doing something else.
87. I love working on multiple tasks at one time.
88. I often find myself switching between the tasks that I am working on instead of focusing on one task at a time.
89. I prefer doing multiple things at the same time, switching my attention from one task to another.
90. I prefer to accomplish two or more tasks simultaneously.
91. I prefer to do many things simultaneously.
92. I prefer to focus my attention on multiple things at a time.
93. I prefer to focus on two or three tasks at once.
94. I prefer to have multiple projects going at the same time rather than just one
95. I prefer to have several tasks going on all at one time.
96. I prefer to multitask.
97. I prefer to start several things before finishing any of them.
98. I prefer to switch my attention between two tasks until they are both complete.

99. I prefer to work on several projects in a day, rather than completing one project and then switching to another.
100. I prefer working on as many tasks as possible at the same time.
101. I think I am more productive if I do two or three things at once.

102. I would rather work on several projects at the same time than concentrate my efforts on just one
103. If I could have my way I would juggle my tasks, doing multiple things at the same time.
104. If I could have my way, I would do many things simultaneously.
105. If I were to choose between working on one task at a time or working on multiple tasks at a time, I would prefer working on multiple tasks at a time.
106. It annoys me if I can do only one thing at a time.
107. When completing a task, I am mentally planning what task to do next.
108. When completing a task, I am mentally switching my attention between the current task and the task I will be completing next.
109. When I have a task to complete, I like to break it up by doing other tasks at the same time.
110. When I'm completing a task, I find myself switching to another task and then coming back to the original task.
111. I prefer not to be interrupted when working on a task.
112. I prefer doing one task at a time.
113. I am easily bothered by distraction when I am trying to concentrate on something
114. I am more comfortable focusing on one task at a time than focusing on several tasks at once.
115. I do not like having to attend to more than one task at a time.
116. I do not like to divide my attention into multiple tasks.
117. I do not like to do multiple things at the same time.
118. I don't like when I have to stop in the middle of a task to work on something else.
119. I get confused if I try to do too many things at one time.
120. I hate having to split or shift my attention while working.
121. I hate multitasking
122. I like to finish one task completely before focusing on anything else.
123. I like working on a few tasks at one time, but become uncomfortable when I have to attend to too many things at once.
124. I prefer not to start something new until I have finished what I was doing.
125. I prefer to finish one task before moving on to another one
126. I would rather put off a task until later than stop the one I am currently performing
127. It makes me very uncomfortable when I am not able to finish one task completely before focusing on another task.
128. When I am completing a task, I prefer to have all of my attention focused on it.

129. I don't mind deviating from my schedule
130. I prioritize tasks in order to get done as much as possible in a block of time
131. I rarely spend more than a few minutes on any one task
132. Sometimes I get so involved in a task that I forget about meetings
133. I dislike being under time pressure in my work
134. I keep a calendar
135. I plan how much time I will allocate to a particular task before starting it
136. I put together a schedule each day and rarely deviate from that schedule
137. I rarely do anything on a whim

Figure 2

Histogram of Item Level Ratings by SMEs

Appendix C

POLY Pilot Measure

Questionnaire/Survey: **Multitasking Preference**

The following is a pilot survey of normal individual preference. There are no correct or incorrect answers, so please answer as honestly and accurately as possible in order to help us in developing this measure. Your responses will be confidential. Please read each item carefully and respond by indicating how much you agree or disagree with the item, using the response scale provided.

In addition to answering the questions, please note those which you find unclear or repetitive, and record this information at the end of the survey in the area provided. Your efforts will help us in further developing this measure.
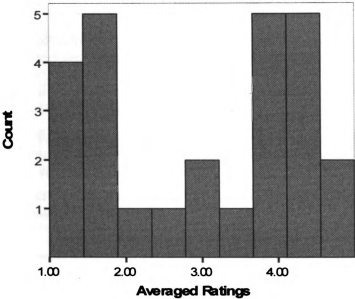
1. I prefer to work on several projects in a day, rather than completing one project and then switching to another.

      C   C   C   C   C

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

2. I would like to work in a job where I was constantly shifting from one task to another, like a receptionist or an air traffic controller.

      C   C   C   C   C

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

3. I lose interest in what I am doing if I have to focus on the same task for long periods of time, without thinking about or doing something else.

      C   C   C   C   C

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

4. When doing a number of assignments, I like to switch back and forth between them rather than do one at a time.

      C   C   C   C   C

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

5. I like working on a few tasks at one time, but become uncomfortable when I have to attend to too many things at once.

    ○   ○   ○   ○   ○

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

6. When I have to focus on one task for a long time (e.g., reading a paper), I get bored.

    ○   ○   ○   ○   ○

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

7. I like to finish one task completely before focusing on anything else.

    ○   ○   ○   ○   ○

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

8. I like to do other things during TV commercials, like read or clean.

    ○   ○   ○   ○   ○

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

9. I prefer to combine cooking with other tasks such as cleaning the house.

    ○   ○   ○   ○   ○

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

10. When I am using a computer, I like to have multiple windows open so I can work on multiple tasks at once.

    ○   ○   ○   ○   ○

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

11. It makes me uncomfortable when I am not able to finish one task completely before focusing on another task.

   ⵁ   ⵁ   ⵁ   ⵁ   ⵁ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

12. I am much more engaged in what I am doing if I am able to switch between several different tasks.

   ⵁ   ⵁ   ⵁ   ⵁ   ⵁ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

13. I do not like having to attend to more than one task at a time.

   ⵁ   ⵁ   ⵁ   ⵁ   ⵁ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

14. While I am driving, I prefer to have the radio off and everyone quiet so I can concentrate solely on driving.

   ⵁ   ⵁ   ⵁ   ⵁ   ⵁ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

15. I would rather work on several projects at the same time than concentrate my efforts on just one.

   ⵁ   ⵁ   ⵁ   ⵁ   ⵁ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

16. I would prefer to work in an environment where I can finish one task before starting the next.

   ⵁ   ⵁ   ⵁ   ⵁ   ⵁ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

17. I would rather wait until the end of the day to check e-mail than check it periodically .

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

18. When I am completing a task, I like to have all of my attention focused on it.

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

19. I don't like when I have to stop in the middle of a task to work on something else.

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

20. I like to talk on my cell phone while driving.

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

21. When I have a task to complete, I like to break it up by doing other tasks at the same time.

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

22. I rarely like to spend more than a few minutes on any one task.

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

23. I have a "one-track" mind.

     ⵔ   ⵔ   ⵔ   ⵔ   ⵔ

Strongly Disagree Neutral Agree Strongly
Disagree   Agree

24. I like preparing meals that require juggling several different tasks (cutting vegetables, cooking noodles) at the same time.

     ○   ○   ○   ○   ○

Strongly   Disagree   Neutral   Agree   Strongly
Disagree   Agree

25. I prefer to frequently check my e-mail while working on a computer.

     ○   ○   ○   ○   ○

Strongly   Disagree   Neutral   Agree   Strongly
Disagree   Agree

26. I prefer not to be interrupted when working on a task.

     ○   ○   ○   ○   ○

Strongly   Disagree   Neutral   Agree   Strongly
Disagree   Agree

You have now completed the measure. Please take a moment to record your thoughts on the pilot measure. IMPORTANT: Due to technological limitations, please do not use apostrophes or quotation marks in your response.

27. Were any of the questions unclear? If so, which one(s)?

28. Were any of the questions repetitive? If so, which one(s)?

29. Do you have any comments or suggestions you feel would be useful for the development of this measure?

Table 1

Inter-Item and Item-Total Correlations for Pilot POLY (N = 111)

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 poly_1	2.77	1.04														
2 poly_2	3.14	1.04	*.41*													
3 poly_3	3.51	1.07	.22	*.35*												
4 poly_4	2.86	1.13	*.58*	*.54*	*.35*											
5 poly_5re	2.29	.95	-.16	-.07	-.14	*.34*										
6 poly_6	3.68	.94	.19	.16	*.57*	*.55*	-.10									
7 poly_7re	2.62	.92	*.46*	*.36*	*.30*	.16	-.12	-.09								
8 poly_8	3.55	1.04	*.28*	*.24*	*.28*	*.29*	.07	*.23*	.14							
9 poly_9	3.09	1.00	.18	*.31*	.19	*.30*	-.15	.12	*.23*	*.29*						
10 poly_10	3.62	1.04	*.25*	.19	*.25*	-.25	.19	*.23*	*.31*	*.25*	*.42*					
11 poly_11re	2.89	1.01	*.35*	*.24*	*.41*	-.06	.12	*.60*	*.23*	*.31*	.06	*.23*				
12 poly_12	2.88	.91	*.53*	*.40*	*.58*	-.19	*.32*	*.53*	*.33*	*.42*	*.37*	*.40*	*.31*			
13 poly_13re	3.03	.96	*.41*	*.45*	*.30*	-.55	-.06	.19	*.44*	*.30*	*.32*	*.40*	*.38*	*.51*		
14 poly_14re	4.59	.69	.06	.17	.13	-.07	-.07	.11	.05	.13	-.01	.06	.09	.07	.13	
15 poly_15	2.79	.99	*.64*	*.32*	*.28*	-.10	*.21*	*.49*	*.21*	*.25*	*.26*	*.38*	*.54*	*.48*	.13	-.10
16 poly_16re	2.72	.92	*.53*	*.43*	*.29*	-.13	*.23*	*.63*	*.24*	*.28*	.16	*.57*	*.55*	*.50*	.48	.12
17 poly_17re	4.20	.85	.01	.15	*.24*	.04	.00	.16	.14	*.26*	-.02	.15	.03	.09	.16	.22
18 poly_18re	2.35	.83	*.23*	*.21*	*.23*	-.14	.08	*.34*	.19	*.26*	*.26*	.13	*.26*	*.24*	.21	.05
19 poly_19re	2.72	.92	*.36*	*.39*	*.50*	-.11	.06	*.46*	*.24*	*.23*	.16	*.35*	*.37*	*.36*	.37	.13
20 poly_20	3.39	1.12	.09	.06	.05	.07	.03	.05	.10	.00	.10	.05	.06	.13	.06	.18
21 poly_21	3.12	.98	*.60*	*.45*	*.47*	-.14	*.37*	*.55*	*.28*	*.26*	*.28*	*.44*	*.61*	*.50*	.35	.15
22 poly_22	2.20	.84	.14	.16	*.30*	-.04	.13	.18	.13	.13	.18	*.24*	*.37*	.19	.37	-.06
23 poly_23re	3.60	.91	*.39*	*.26*	*.30*	-.10	*.21*	*.39*	*.26*	*.36*	*.34*	*.35*	*.38*	*.41*	.38	.10
24 poly_24	3.37	1.03	.15	.06	.16	-.04	.15	.13	*.21*	*.31*	*.26*	.07	*.23*	*.42*	.42	.03
25 poly_25	4.15	.78	*.23*	.13	.16	.09	.11	.07	.14	.05	*.20*	.00	.14	.15	.15	.05
26 poly_26re	2.45	.92	.15	.19	.17	-.03	.08	*.39*	*.20*	*.24*	*.20*	*.40*	*.23*	*.27*	.27	.10
27 poly_FULL	81.59	12.42	*.65*	*.61*	*.70*	-.08	*.41*	*.69*	*.53*	*.47*	*.40*	*.57*	*.73*	*.71*	.50	.20
28 poly_EDIT	53.74	10.92	*.68*	*.62*	*.74*	-.18	*.33*	*.49*	*.49*	*.49*	*.61*	*.75*	*.70*	.50	.70	.12

Note. poly_FULL refers to the 26-item measure and poly_EDIT refers to the edited version with 18 items.
Reliabilities (Cronbach's alpha) are listed in parentheses.
Correlations in **bold italic** are significant at *p* < .05.

Table 1 cont'd

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
16	.61													
17	-.10	.06												
18	.22	.36	-.14											
19	.37	.45	.06	.38										
20	.13	.10	-.01	.21	.07									
21	.54	.57	.03	.29	.45	.20								
22	.31	.26	-.28	.06	.17	.08	.26							
23	.32	.49	.13	.34	.08	.20	.34	.08						
24	.08	.16	.00	.13	.22	-.03	.06	.05	.22					
25	.08	.04	.56	-.06	.08	.03	.20	-.17	.13	.19				
26	.34	.24	.06	.41	.26	.19	.34	.05	.16	.10	-.05			
27	.66	.72	.22	.44	.56	.26	.74	.32	.58	.37	.25	.45	(.88)	
28	.70	.75	.12	.47	.60	.16	.75	.30	.16	.10	.15	.47	.98	(.90)

Figure 3

Scree Plot for EFA on Full POLY Pilot Measure

Scree Plot
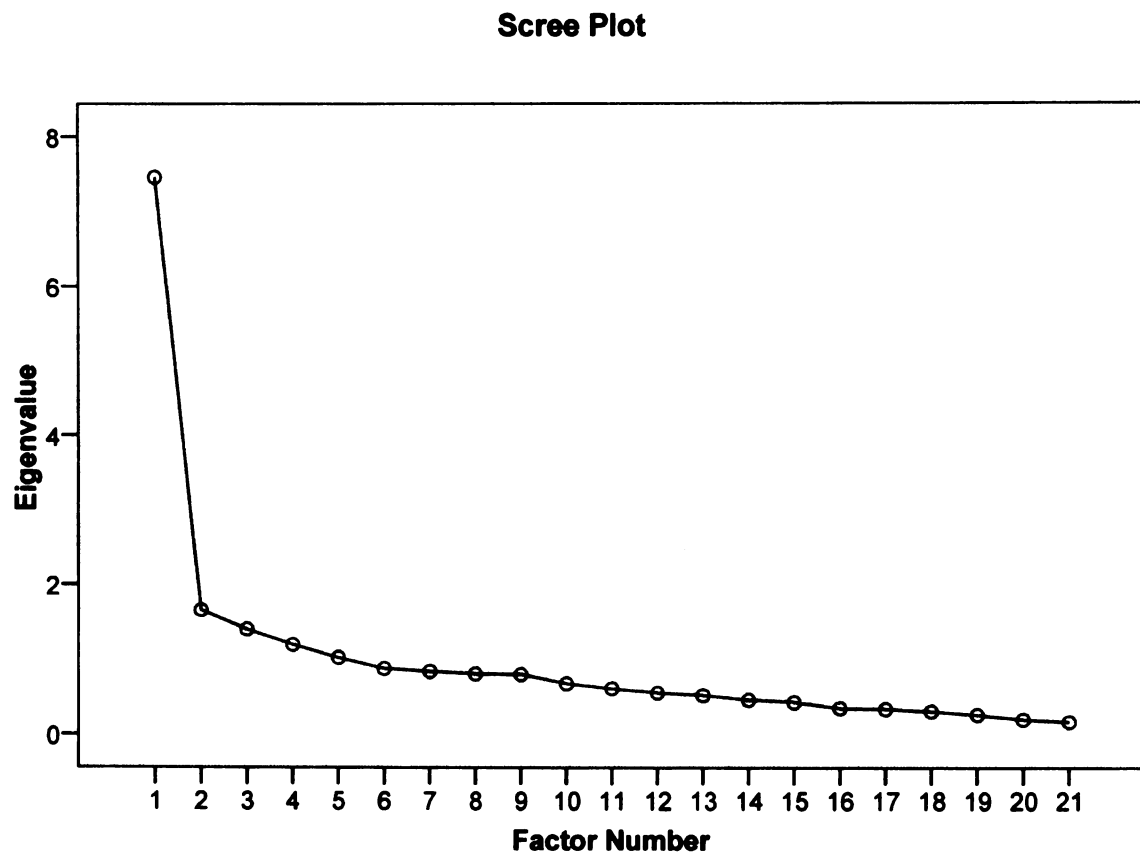
Table 2

Eigenvalues for EFA on Full POLY Pilot Measure

Factor	Initial Eigenvalues		
	Total	% Variance	Cumulative %
1	7.46	35.52	35.52
2	1.66	7.89	43.41
3	1.40	6.68	50.08
4	1.20	5.69	55.78
5	1.02	4.87	60.65
6	.88	4.19	64.84
7	.84	4.01	68.85
8	.81	3.86	72.71
9	.80	3.82	76.53
10	.68	3.24	79.77
11	.61	2.93	82.70
12	.56	2.66	85.36
13	.53	2.50	87.86
14	.47	2.22	90.08
15	.43	2.07	92.14
16	.36	1.69	93.83
17	.34	1.64	95.47
18	.31	1.49	96.96
19	.27	1.27	98.22
20	.20	.96	99.18
21	.17	.82	100.00

Extraction Method: Principal Axis Factoring.

Table 3

Factor Loadings for EFA on Full POLY Pilot Measure

Factor Loadings

	Factor 1	2	3	4	5
poly_1	.67			-.21	
poly_2	.59				-.35
poly_3	.48	.39	-.24		
poly_4	.74			-.30	
poly_6	.37	.60	-.44	.28	
poly_7re	.72	-.27			
poly_8	.43				
poly_9	.44	.25	.41		
poly_10	.44	.32	.31		.30
poly_11re	.59	-.28		.28	
poly_12	.75				
poly_13re	.69				
poly_15	.70				.22
poly_16re	.76	-.20			
poly_18re	.42		.24	.31	
poly_19re	.56	-.23			
poly_21	.75				
poly_22	.33				.21
poly_23re	.55				
poly_24	.31	.29	.29		
poly_26re	.41		.22	.39	

Extraction Method: Principal Axis Factoring.

5 factors extracted. 58 iterations required.

Figure 4

Scree Plot for EFA on Edited POLY Pilot Measure

Scree Plot
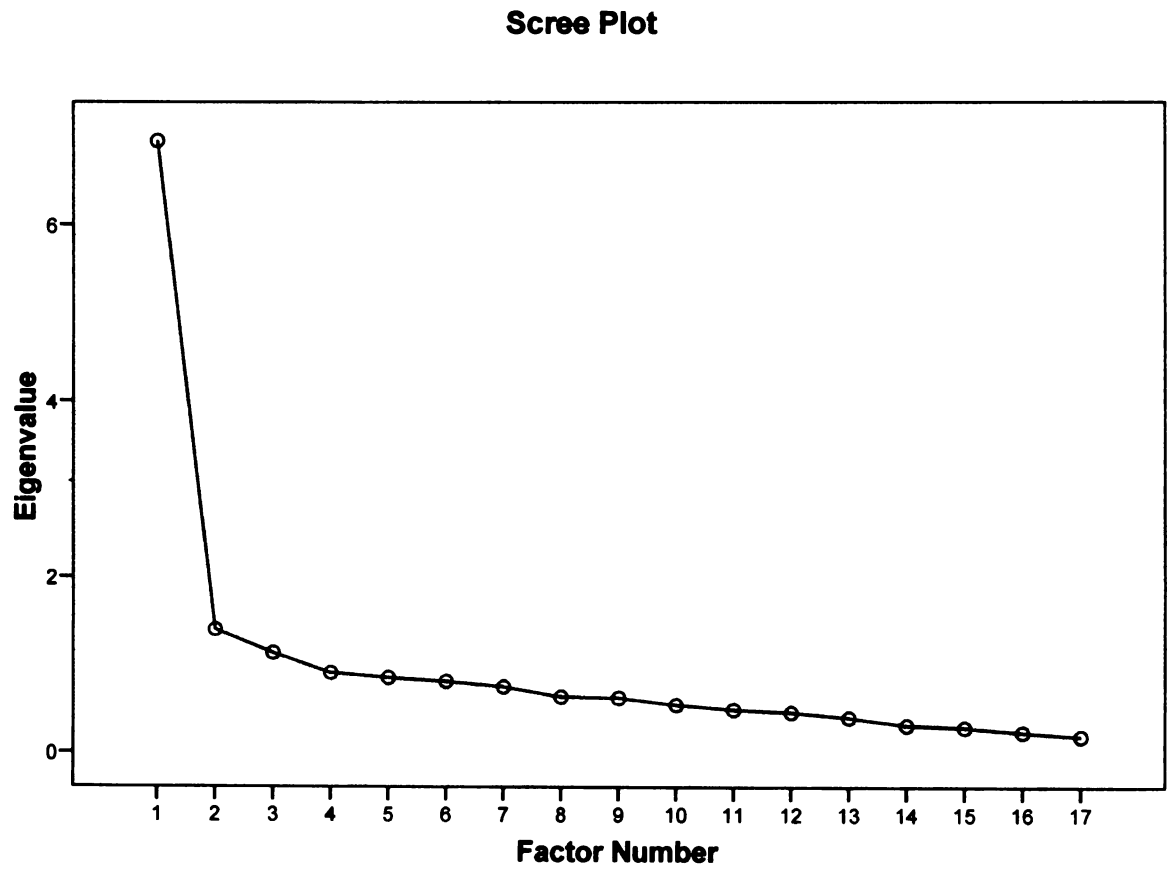
Table 4

Eigenvalues for EFA on Edited POLY Pilot Measure

Factor	Initial Eigenvalues		
			Cumulative
	Total	% Variance	%
1	6.95	40.88	40.88
2	1.40	8.24	49.12
3	1.13	6.66	55.78
4	.91	5.33	61.11
5	.85	5.01	66.12
6	.81	4.77	70.89
7	.75	4.40	75.29
8	.64	3.74	79.03
9	.63	3.68	82.72
10	.55	3.22	85.94
11	.49	2.91	88.84
12	.46	2.71	91.56
13	.40	2.37	93.92
14	.32	1.86	95.78
15	.29	1.71	97.50
16	.24	1.39	98.89
17	.19	1.11	100.00

Extraction Method: Principal Axis Factoring.

Table 5

Factor Loadings for EFA on Edited POLY Pilot Measure

	Factor		
	1	2	3
poly_1	.69		-.30
poly_2	.58		
poly_3	.44		
poly_4	.75		-.27
poly_7re	.74	-.26	
poly_8	.42		
poly_9	.43	.48	
poly_10	.43	.44	.23
poly_11re	.61	-.38	.42
poly_12	.75		
poly_13re	.68		
poly_15	.71		
poly_16re	.76	-.21	
poly_19re	.56		
poly_21	.74		
poly_23re	.54		
poly_26re	.40		.32

Extraction Method: Principal Axis Factoring.
3 factors extracted. 18 iterations required.

Appendix D

POLY Measure Editing and Item Deletion

Note. Items in italics were deleted; bold words reflect edits.

1. I prefer to work on several projects in a day, rather than completing one project and then switching to another.
2. I would like to work in a job where I was constantly shifting from one task to another, like a receptionist or an air traffic controller.
3. I lose interest in what I am doing if I have to focus on the same task for long periods of time, without thinking about or doing something else.
4. When doing a number of assignments, I like to switch back and forth between them rather than do one at a time.
5. *I like working on a few tasks at one time, but become uncomfortable when I have to attend to too many things at once.*
6. *When I have to focus on one task for a long time (e.g., reading a paper), I get bored.*
7. I like to finish one task completely before focusing on anything else.
8. I like to do other things during TV commercials, like read or clean.
9. I prefer to combine cooking with other tasks such as cleaning the house.
10. When I am using a computer, I like to have multiple windows open so I can **switch between multiple tasks.**
11. It makes me uncomfortable when I am not able to finish one task completely before focusing on another task.
12. I am much more engaged in what I am doing if I am able to switch between several different tasks.
13. I do not like having to **shift my attention between multiple tasks.**
14. *While I am driving, I prefer to have the radio off and everyone quiet so I can concentrate solely on driving.*
15. I would rather **switch back and forth between** several projects than concentrate my efforts on just one.
16. I would prefer to work in an environment where I can finish one task before starting the next.
17. *I would rather wait until the end of the day to check e-mail than check it periodically throughout.*
18. *When I am completing a task, I like to have all of my attention focused on it.*
19. I don't like when I have to stop in the middle of a task to work on something else.
20. *I like to talk on my cell phone while driving.*
21. When I have a task to complete, I like to break it up by **switching to other tasks intermittently.**
22. *I rarely like to spend more than a few minutes on any one task.*
23. I have a "one-track" mind.
24. *I like preparing meals that require juggling several different tasks (cutting vegetables, cooking noodles) at the same time.*
25. *I prefer to frequently check my e-mail while working on a computer.*
26. I prefer not to be interrupted when working on a task.

Figure 5

Histogram of Item Means for 17-item POLY
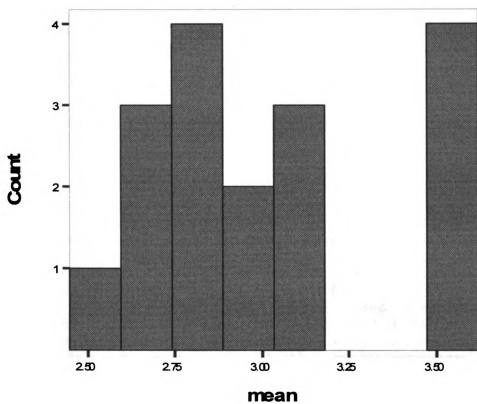
Appendix E

Informed Consent Form
Please read and enter full name

Abstract: You are being asked to participate in a study examining the contributions of ability and non-ability measures to multi-tasking performance. The goal of this study is to understand multi-tasking, specifically in understanding how people do multi-tasking in a computerized environment and the extent to which individual differences such as interest in multitasking predict performance and change over time in such a task. By securing this sort of understanding, we can make advances in determining how to improve systems for selecting and/or training individuals in tasks that require multi-tasking.

Procedure: The project in which you have been asked to participate has two sessions. First is an online session during which you will complete one survey. Second is a session in the laboratory where you will complete a series of surveys and perform a computerized work task.

Risks: There are no foreseeable risks associated with participating in this study. Your privacy will be protected in several ways. First, you will only be asked to provide the last five digits of your PID. This information will be deleted from our records immediately after the data from both study sessions are collected (the PID is used simply to connect your responses across the measures from both sessions and so that we are able to give you extra credit for your participation). Second, responses on all of the items on the questionnaires and your performance data on the computerized tasks will be completely confidential. The data will only be accessible by the primary (Dr. Fred Oswald and Elizabeth Oberlander) investigators in the study. Third, the information gathered in this study will be combined with the data of all of the other participants in the study for any analyses so that your responses cannot be identified. Any data reported from this study will be in such a way that no one will be able to identify a particular participant (e.g., by giving typical results averaged across participants). Your privacy will be protected to the maximum extent allowable by law.

Benefits: You will gain experience in taking computer-based tests as well as experience in taking a variety of different tests. You will learn more about how psychological research is done. You will receive course credit for your participation.

By signing below, you indicate that you are free to refuse to participate in this project or any part of the project. You may refuse to answer some of the questions and may discontinue your participation at any time.

If you have any questions or concerns about your participation in this project, you can contact Fred Oswald, 317 Psychology Building, East Lansing, MI 48824 (foswald@msu.edu, 517-432-9943). If you have any questions or concerns regarding your rights as a study participant, or are dissatisfied at any time with any aspect of this study, you may contact - anonymously, if you wish - Peter Vasilenko, Ph.D., Director of Human Research Protections, (517)355-2180, fax (517)432-4503, e-mail irb@msu.edu, mail 202 Olds Hall, Michigan State University, East Lansing, MI 48824-1047.

Please PRINT your full name below:

_____	_____	_____
First	MI	Last

Appendix F

POLY Pretest

The following is a survey of normal individual preference. There are no correct or incorrect answers, so please answer as honestly and accurately as possible. Your responses will be confidential. Please read each item carefully and respond by indicating how much you agree or disagree with the item, using the response scale provided. Please note the ordering of the response scale- from strongly agree to strongly disagree.

1. I prefer to work on several projects in a day, rather than completing one project and then switching to another.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

2. I would like to work in a job where I was constantly shifting from one task to another, like a receptionist or an air traffic controller.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

3. I lose interest in what I am doing if I have to focus on the same task for long periods of time, without thinking about or doing something else.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

4. When doing a number of assignments, I like to switch back and forth between them rather than do one at a time.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

5. I like to finish one task completely before focusing on anything else.

        ◯   ◯   ◯   ◯   ◯

              Agree Neutral Disagree Strongly
Strongly   Disagree
Agree

6. I like to do other things during TV commercials, like read or clean.

        ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

7. I prefer to combine cooking with other tasks such as cleaning the house.

        ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

8. When I am using a computer, I like to have multiple windows open so I can switch between multiple tasks.

        ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

9. It makes me uncomfortable when I am not able to finish one task completely before focusing on another task.

        ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

10. I am much more engaged in what I am doing if I am able to switch between several different tasks.

        ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

11. I do not like having to shift my attention between multiple tasks.

    ◌   ◌   ◌   ◌   ◌

Strongly   Agree   Neutral   Disagree   Strongly
   Agree   Disagree

12. I would rather switch back and forth between several projects than concentrate my efforts on just one.

    ◌   ◌   ◌   ◌   ◌

Strongly   Agree   Neutral   Disagree   Strongly
   Agree   Disagree

13. I would prefer to work in an environment where I can finish one task before starting the next.

    ◌   ◌   ◌   ◌   ◌

Strongly   Agree   Neutral   Disagree   Strongly
   Agree   Disagree

14. I don't like when I have to stop in the middle of a task to work on something else.

    ◌   ◌   ◌   ◌   ◌

Strongly   Agree   Neutral   Disagree   Strongly
   Agree   Disagree

15. When I have a task to complete, I like to break it up by switching to other tasks intermittently.

    ◌   ◌   ◌   ◌   ◌

Strongly   Agree   Neutral   Disagree   Strongly
   Agree   Disagree

16. I have a "one-track" mind.

    ◌   ◌   ◌   ◌   ◌

Strongly   Agree   Neutral   Disagree   Strongly
   Agree   Disagree

17. I prefer not to be interrupted when working on a task.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

Polychronicity is a personal preference variable that describes an individual's preference for shifting attention among tasks that are incomplete (multitasking), rather than focusing on each task until completion and then switching to the next task. The measure you just took is called the POLY and is intended to measure polychronicity. With this in mind, please answer the following:

18. I did not understand what the POLY had to do with polychronicity.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

19. I could not see any relationship between the POLY and polychronicity.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

20. It would be obvious to anyone that the POLY is related to polychronicity.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

21. The actual content of the POLY was clearly related to polychronicity.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

22. There was no real connection between the POLY and polychronicity.

   C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

23. The items in the POLY were clear to me.

       ◯   ◯   · ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

24. The items in the POLY were repetitive.

       ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

You have now completed the pretest. Attendance at the lab session you have chosen is required in order to gain full credit for this study. Please remember to write down your lab session time and the room number and show up 5 minutes early.

25. I understand that I must show up at the lab session in order to get credit for this experiment.

  ◯ Yes

Appendix G

*Test of Cognitive Ability: Raven's Progressive Matrices Example*
This is a test of perception and clear thinking. This section contains a series of problems, and each problem is presented as symbols arranged in a grid of 3 rows and 3 columns. The bottom right corner of this grid is missing a symbol, however, and you are to determine which one of the 8 possible solutions best completes the matrix.
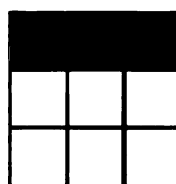Try the following example:
In the example below, the top part of the problem is a pattern with a bit cut out of it. Look at the pattern, think what the piece needed to complete the pattern correctly across and down must look like. Then find the right piece out of the eight bits shown below. Only one of these pieces is perfectly correct.
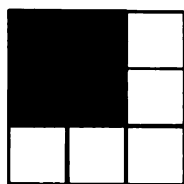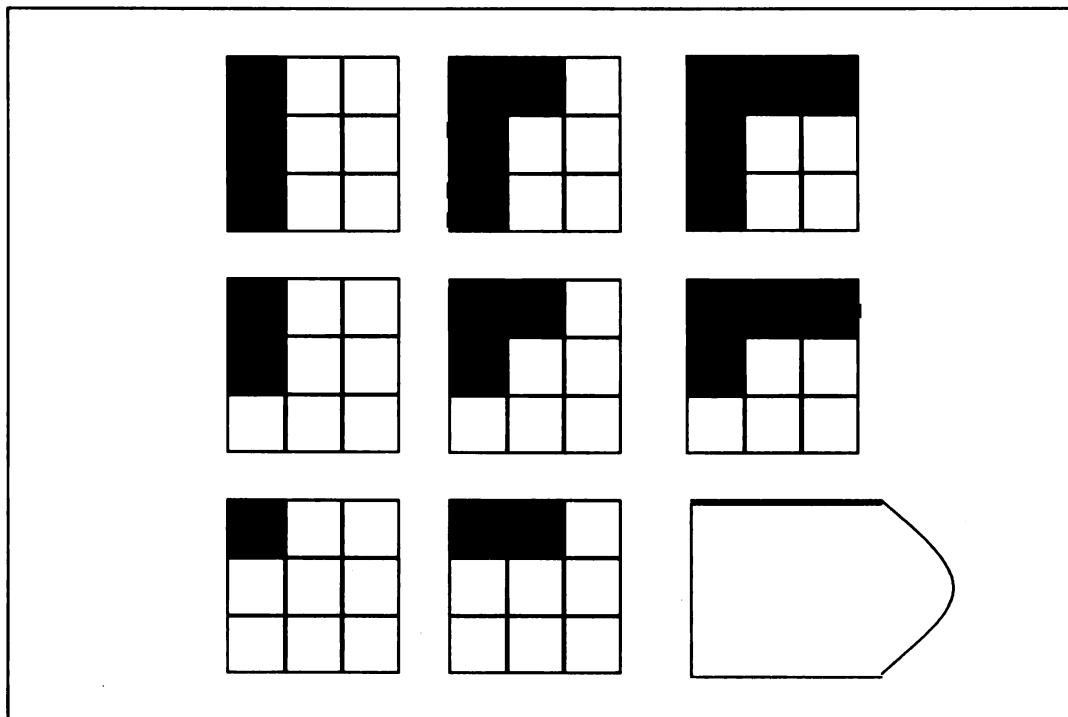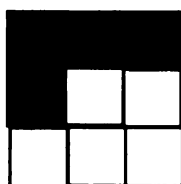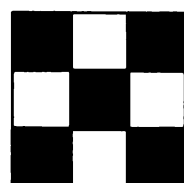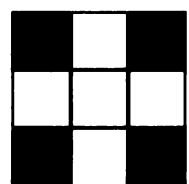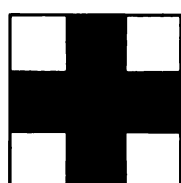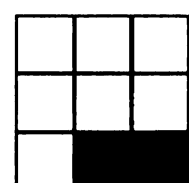

No. 2 completes the pattern correctly going across, but is wrong going the other way. No. 3 is going both across and downward the right way. <u>No. 3</u> is the right bit.

Appendix H

Online Measures

Please respond to the following questions to the best of your ability. You are not required to provide this information, but opting not to do so may render your other responses unusable in some analyses. Remember, your responses will be confidential.

1. What is your overall GPA?
    - ◌ 3.5 to 4.0
    - ◌ 3.0 to 3.4
    - ◌ 2.5 to 2.9
    - ◌ 2.0 to 2.4
    - ◌ 1.5 to 1.9
    - ◌ less than 1.5

2. What is your age?
    - ◌ over 32 years old
    - ◌ 29 to 31 years old
    - ◌ 26 to 28 years old
    - ◌ 23 to 25 years old
    - ◌ 20 to 22 years old
    - ◌ 18 to 19 years old
    - ◌ 17 or under

3. What is your gender?
    - ◌ Male
    - ◌ Female

4. What is your year in school?

- ○ Freshman
- ○ Sophomore
- ○ Junior
- ○ Senior
- ○ 5th Year +

5. What ethnicity do you consider yourself to be?

- ○ Mexican American
- ○ Puerto Rican
- ○ Other Hispanic
- ○ American Indian or Alaskan Native
- ○ Asian
- ○ Black/African American
- ○ White/Caucasian/Not of Hispanic Origin
- ○ Native Hawaiian or Pacific Islander
- ○ Other

6. What was your SAT verbal score (if you took the new SAT, what was your reading score)? If you did not take the SAT, please answer accordingly.

- ○ I did not take the SAT
- ○ 750-800
- ○ 700-749
- ○ 650-699
- ○ 600-649
- ○ 550-599
- ○ 500-549
- ○ 450-499
- ○ 400-449
- ○ 350-399
- ○ 349 or below

7. What was your SAT math score? If you did not take the SAT, please answer accordingly.

    ◯   I did not take the SAT

    ◯   750-800

    ◯   700-749

    ◯   650-699

    ◯   600-649

    ◯   550-599

    ◯   500-549

    ◯   450-499

    ◯   400-449

    ◯   350-399

    ◯   349 or lower

8. What was your overall ACT score? If you did not take the ACT, please answer accordingly.

    ◯   I did not take the ACT

    ◯   34 or higher

    ◯   31-33

    ◯   28-30

    ◯   25-27

    ◯   22-24

    ◯   19-21

    ◯   16-18

    ◯   13-15

    ◯   12 or lower

9. Please indicate your handedness.

    ◯   Lefthanded

    ◯   Righthanded

10. How much experience do you have playing video games?

    ◌   None

    ◌   Some

    ◌   A fair amount

    ◌   A lot

    ◌   An extreme amount

11. In general, how good would you say you are at video games, compared with other people?

    ◌   Don't ever play video games

    ◌   Not very good

    ◌   About average

    ◌   Pretty good

    ◌   Very good

The following is a survey of normal individual preference. There are no correct or incorrect answers, so please answer as honestly and accurately as possible. Your responses will be confidential. Please read each item carefully and respond by indicating how much you agree or disagree with the item, using the response scale provided. Please note the ordering of the response scale- from strongly agree to strongly disagree.

12. I prefer to work on several projects in a day, rather than completing one project and then switching to another.

    ◌   ◌   ◌   ◌   ◌

    Strongly Agree Neutral Disagree Strongly
     Agree   Disagree

13. I would like to work in a job where I was constantly shifting from one task to another, like a receptionist or an air traffic controller.

    ◌   ◌   ◌   ◌   ◌

    Strongly Agree Neutral Disagree Strongly
     Agree   Disagree

14. I lose interest in what I am doing if I have to focus on the same task for long periods of time, without thinking about or doing something else.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

15. When doing a number of assignments, I like to switch back and forth between them rather than do one at a time.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

16. I like to finish one task completely before focusing on anything else.

     C   C · C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

17. I like to do other things during TV commercials, like read or clean.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

18. I prefer to combine cooking with other tasks such as cleaning the house.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

19. When I am using a computer, I like to have multiple windows open so I can switch between multiple tasks.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

20. It makes me uncomfortable when I am not able to finish one task completely before focusing on another task.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
 Agree   Disagree

21. I am much more engaged in what I am doing if I am able to switch between several different tasks.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
 Agree   Disagree

22. I do not like having to shift my attention between multiple tasks.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
 Agree   Disagree

23. I would rather switch back and forth between several projects than concentrate my efforts on just one.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
 Agree   Disagree

24. I would prefer to work in an environment where I can finish one task before starting the next.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
 Agree   Disagree

25. When I am completing a task, I like to have all of my attention focused on it.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
 Agree   Disagree

26. I don't like when I have to stop in the middle of a task to work on something else.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

27. When I have a task to complete, I like to break it up by switching to other tasks intermittently.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

28. I have a 'one-track' mind.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

29. I prefer not to be interrupted when working on a task.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

Please use the rating scale below to describe how accurately each of these statements describes you. Describe yourself as you generally are now, not as you wish to be in the future. This is a survey of typical behavior, so there are no right or wrong answers. Generally, I...

30. Am the life of the party.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

31. Get stressed out easily.

      C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

32. Don't talk a lot.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

33. Am relaxed most of the time.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

34. Feel comfortable around people.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

35. Worry about things.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

36. Keep in the background.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

37. Seldom feel blue.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

38. Start conversations.

    ◯   ◯   ◯   ◯   ◯

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

39. Am easily disturbed.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

40. Have little to say.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

41. Get upset easily.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

42. Talk to a lot of different people at parties.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

43. Change my mood a lot.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

44. Don't like to draw attention to myself.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

45. Have frequent mood swings.

       C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

46. Don't mind being the center of attention.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

47. Get irritated easily.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

48. Am quiet around strangers.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

49. Often feel blue.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

50. I would prefer complex to simple problems.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

51. I like to have the responsibility of handling a situation that requires a lot of thinking.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

52. Thinking is not my idea of fun.

     ☐   ☐   ☐   ☐   ☐

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

53. I would rather do something that requires little thought than something that is sure to challenge my thinking abilities.

     ☐   ☐   ☐   ☐   ☐

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

54. I try to anticipate and avoid situations where there is a likely chance I will have to think in depth about something.

     ☐   ☐   ☐   ☐   ☐

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

55. I find satisfaction in deliberating hard and long for hours.

     ☐   ☐   ☐   ☐   ☐

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

56. I only think as hard as I have to.

     ☐   ☐   ☐   ☐   ☐

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

57. I prefer to think about small, daily projects to long-term ones.

     ☐   ☐   ☐   ☐   ☐

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

58. I like tasks that require little thought once I've learned them.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

59. The idea of relying on thought to make my way to the top appeals to me.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

60. I really enjoy a task that involves coming up with new solutions to problems.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

61. Learning new ways to think doesn't excite me very much.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

62. I prefer my life to be filled with puzzles that I must solve.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

63. The notion of thinking abstractly is appealing to me.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

64. I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought.

    ○   ○   ○   ○   ○

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

65. I feel relief rather than satisfaction after completing a task that requires a lot of mental effort.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

66. It's enough for me that something gets the job done; I don't care how or why it works.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

67. I usually end up deliberating about issues even when they do not affect me personally.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

The following is a survey of normal individual preference. There are no correct or incorrect answers, so please answer as honestly and accurately as possible. Your responses will be confidential. Please read each item carefully and respond by indicating how much you agree or disagree with the item, using the response scale provided.

68. I do not like to juggle several activities at the same time.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

69. People should not try to do many things at once.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

70. When I sit down at my desk, I work on one project at a time.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

71. I am comfortable doing several things at the same time.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

72. I like to juggle several activities at the same time.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

73. I would rather complete an entire project every day than complete parts of several projects.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

74. I believe that people should try to do many things at once.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

75. When I work by myself, I usually work on one project at a time.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

76. I prefer to do one thing at a time.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

77. I believe people do their best work when they have many tasks to complete.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

78. I believe it is best to complete one task before beginning another.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

79. I believe that it is best for people to be given several tasks and assignments to perform.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

80. I seldom like to work on more than a single task or assignment at the same time.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

81. I would rather complete parts of several projects every day than complete an entire project.

     C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

Please answer the following questions to the best of your ability.
Choose the answer that best represents you.

82. When you are faced with an unfamiliar problem, what do you usually do?

    C   Address the problem immediately

    C   Think about what to do and then take action

    C   Sit back and let things work out for themselves

83. Compared with other students, how quickly do you usually complete your class assignments?

    ○   I am usually finished before everyone else

    ○   I finish faster than most of my classmates

    ○   I finish right on time

    ○   I frequently turn in assignments late

84. Has anyone ever told you that you talk too much?

    ○   Yes, often

    ○   A couple of times

    ○   Once

    ○   No, never

85. During normal conversation, how quickly do you speak?

    ○   Faster than most people

    ○   At an average pace

    ○   Slower than most people

86. How often do you finish other people's sentences because they speak too slowly?

    ○   Frequently

    ○   Sometimes

    ○   Almost never

87. Imagine that you are waiting at the doctor's office 30 minutes past your appointment time, and have several chores to do when you get home. What would you do?

    ○   Read a magazine

    ○   Keep checking your watch

    ○   Get impatient and somewhat angry

    ○   Complain to the nurse

88. How often are you late for appointments?
   - ○ Most of the time
   - ○ Sometimes
   - ○ Rarely
   - ○ Never

89. When you are playing a game, how important is it for you to win?
   - ○ Very important
   - ○ Sometimes important
   - ○ Not important at all

90. How would your classmates and friends rate you?
   - ○ Always hardworking and serious
   - ○ Sometimes hardworking and serious
   - ○ Rarely hardworking and serious
   - ○ Carefree

91. How would your parents (or previous guardians) rate you?
   - ○ Always helpful
   - ○ Mostly helpful
   - ○ Sometimes helpful
   - ○ Never helpful

92. How would your closest friends rate your general activity level?
   - ○ Too slow – never gets anything done
   - ○ Slow – but gets things done
   - ○ Average – reasonably busy
   - ○ Too active – should slow down

93. How often do you worry about future events?

      ○   Constantly

      ○   Frequently

      ○   Sometimes

      ○   Never

94. When you have free time, what would you prefer to do?

      ○   Sleep

      ○   Watch TV

      ○   Go Shopping

      ○   Catch up on work or household chores

95. Looking back now, how would you rate your behavior as a child?

      ○   I was a problem child

      ○   I was difficult to discipline

      ○   I was an ordinary child

      ○   I was a little angel

96. You have a large amount of homework to do, but your closest friends are having a party. What do you do?

      ○   Join the party

      ○   Do some homework and then join the party

      ○   Finish all of your homework and miss the party

97. Do you keep a daily schedule or calendar of your plans?

      ○   No, never

      ○   Sometimes

      ○   Yes, always

98. When you are in a group situation (like completing a group project), how do you usually act?

    ◯   I rarely participate

    ◯   I act as a team player

    ◯   I take charge

99. How far in advance would you study for a major test?

    ◯   Two weeks ahead or more

    ◯   About one week before the test

    ◯   A day or two beforehand

    ◯   I usually don't study

100. What is an ordinary day in your life like?

    ◯   Full of problems

    ◯   Full of fun

    ◯   A mixture of problems and fun

    ◯   There are never enough things to keep me busy

101. How many days per week do you engage in physical exercise?

    ◯   Four or more

    ◯   Two or three

    ◯   One

    ◯   I don't exercise

Figure 6

SynWin Screen Shot
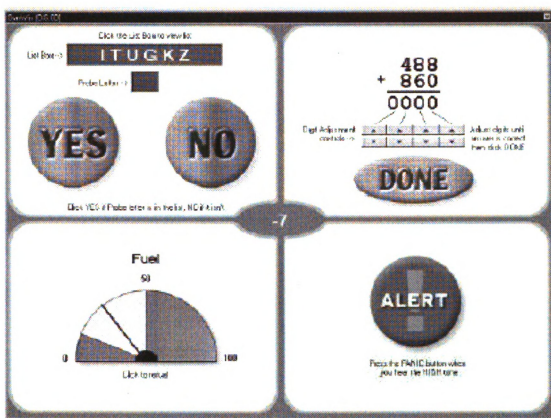
Note. The text is not readable and the screenshot is used for demonstration purposes only.

Figure 7

Histogram of Average Anxiety Ratings
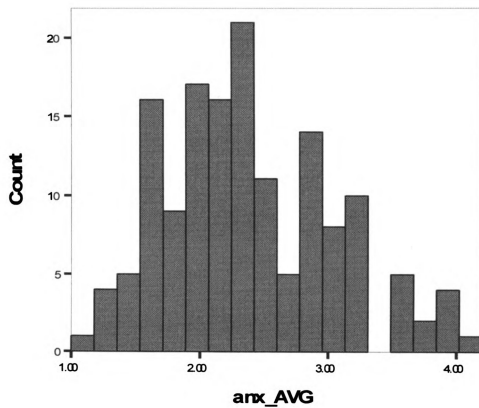
Appendix I

Online Posttests

Now that you have completed the task, please use the rating scale below to describe how accurately each of these words below described you DURING THE SYNWIN TASK YOU JUST PERFORMED. This is a survey of normal feelings participants have, so there are no right or wrong answers. Just answer quickly and honestly.

1. Calm

    ○   ○   ○   ○   ○

Not a little Moderately Quite Extremely
at   bit   a bit
all

2. Relaxed

    ○   ○   ○   ○   ○

Not a little Moderately Quite Extremely
at   bit   a bit
all

3. Tense

    ○   ○   ○   ○   ○

Not a little Moderately Quite Extremely
at   bit   a bit
all

4. Stressed

    ○   ○   ○   ○   ○

Not a little Moderately Quite Extremely
at   bit   a bit
all

5. At ease

   C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

6. Upset

   C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

7. Anxious

   C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

8. Nervous

   C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

9. Scared

   C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

10. Comfortable

   C   . C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

11. Bored

   ◦   ◦   ◦   ◦   ◦

Not a little Moderately Quite Extremely
at   bit   a bit
all

12. Excited

   ◦   ◦   ◦   ◦   ◦

Not a little Moderately Quite Extremely
at   bit   a bit
all

13. Active

   ◦   ◦   ◦   ◦   ◦

Not a little Moderately Quite Extremely
at   bit   a bit
all

14. Under-stimulated

   ◦   ◦   ◦   ◦   ◦

Not a little Moderately Quite Extremely
at   bit   a bit
all

15. Energized

   ◦   ◦   ◦   ◦   ◦

Not a little Moderately Quite Extremely
at   bit   a bit
all

16. Uninterested

   ◦   ◦   ◦   ◦   ◦

Not a little Moderately Quite Extremely
at   bit   a bit
all

17. Wound-up

    C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

18. Lazy

    C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

19. Animated

    C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

20. Thrilled

    C   C   C   C   C

Not a little Moderately Quite Extremely
at   bit   a bit
all

Now that you have completed the task, please use the rating scale below to describe how accurately each of these statements describes your experience of the SynWin task you just took. This is a survey of normal feelings participants have, so there are no right or wrong answers. Again, just answer quickly and honestly.

21. I enjoyed the SynWin task.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
  Agree   Disagree

22. I would like to perform the SynWin task again sometime.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

23. I would recommend this experiment to my friends because it was fun.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

24. The SynWin task is similar to things I like to do in 'real life'.

    C   C   C   C   C

Strongly Agree Neutral Disagree Strongly
Agree   Disagree

Imagine that we have asked you to provide us with another block of performance data on the SynWin task, but that you are free to choose the number of tasks you would like to perform- keep in mind that the score you receive will not be dependent on the number of tasks, and you are free to choose however many tasks you would prefer to perform at once. What would you choose?

25. Please indicate how many tasks you would like to perform:

   C   1

   C   2

   C   3

   C   4

26. Please explain why you chose to perform this many tasks, as opposed to the other options (note. due to technical limitations, do not use apostrophes or quotation marks in your response):

Table 6
Scale Means, SDs, Reliabilities, and Intercorrelations

	N	M	SD	1	2	3	4	5	6	7	8	9	10
1 prepoly17	127	52.74	9.08	(.88)									
2 prepoly14	130	41.95	8.21	*.98*	(.89)								
3 poly17	147	53.37	9.51	*.85*	*.83*	(.90)							
4 poly14	149	42.54	8.56	*.82*	*.83*	*.98*	(.91)						
5 extra	152	35.28	6.05	.02	.05	.12	.14	(.88)					
6 neuro	150	26.58	6.39	.02	-.01	-.07	-.11	*-.25*	(.88)				
7 nfc	147	60.27	9.94	-.05	-.08	.06	.04	.16	*-.22*	(.91)			
8 pai	152	13.29	2.66	*.62*	*.62*	*.73*	*.74*	.17	*-.20*	*.20*	(.80)		
9 ipv	151	29.42	6.12	*.75*	*.76*	*.85*	*.84*	.08	-.15	.09	*.79*	(.89)	
10 anx	149	23.93	6.60	*-.18*	*-.18*	-.16	-.15	-.01	*.24*	*-.22*	*-.26*	*-.22*	(.87)
11 exc	150	30.70	6.54	.00	-.05	.08	.04	-.07	-.07	*.23*	.07	.00	*.30*
12 enj	150	13.20	3.26	.17	.13	*.31*	*.28*	-.12	-.06	*.28*	*.31*	*.30*	-.15
13 ms_2	152	367.04	172.80	.16	*.18*	.09	.12	.10	*-.20*	.12	-.01	-.01	-.12
14 as_2	152	542.50	199.69	.04	.07	.04	.04	.08	-.09	.06	-.02	-.02	*-.18*
15 vs_2	152	201.48	134.42	*-.04*	-.02	-.02	.00	.03	*-.19*	.01	*.24*	.10	*-.18*
16 ts_2	152	179.28	114.01	.17	*.18*	.14	.14	-.02	.03	.08	*.24*	*.16*	-.15
17 cs_2	152	1290.30	405.76	.12	.15	.09	.11	.08	*-.20*	.10	*.21*	.08	*-.24*
18 ms_3	152	466.25	147.72	.09	.11	.08	.10	.12	*-.19*	.11	-.02	-.02	*-.17*
19 as_3	152	666.12	232.06	.03	.05	.05	.04	-.06	.00	.15	.00	.00	-.05
20 vs_3	152	232.92	57.23	-.08	-.06	-.01	.00	.00	*-.18*	.04	*.19*	.07	*-.25*
21 ts_3	152	272.57	78.68	.10	.12	.10	.13	-.05	-.10	.01	.10	.12	*-.18*
22 cs_3	152	1637.86	354.74	.07	.10	.09	.09	.05	*-.22*	*.22*	*.22*	.04	*-.26*
23 ch_1	152	3.20	.91	.02	.01	*.18*	*.17*	*.34*	*-.22*	*.33*	*.29*	*.22*	*-.32*
24 cogabil	156	8.98	2.19	.12	.13	.12	.13	.08	-.16	*.22*	.09	.05	-.04

Note. Scale alpha reliabilities are listed on the diagonal. Correlations in bold are significant at p < .05.

Table 6 cont'd

	11	12	13	14	15	16	17	18	19	20	21	22	23
11	(.82)												
12	.42	(.83)											
13	-.04	.07	.18										
14	-.05	.05	.22	.32									
15	.00	.20	.20	.09	.30								
16	.04	.12	.70	.58	.24	.54							
17	-.02	.17	.83	.09	.73	.14	.58						
18	-.06	.04	-.06	.14	.01	.18	.07	.01					
19	.09	.11	.12	.11	.65	.27	.45	.24	.26				
20	-.03	.21	.19	.13	.40	.70	.50	.17	.20	.50			
21	.07	.23	.63	.16	.52	.39	.69	.79	.32	.73	.57		
22	.12	.57	.20	.09	.25	.16	.28	.19	.06	.21	.24	.27	
23	.06	.04	.16	.33	.11	.10	.29	.12	.30	-.09	.11	.26	.09

Table 7

Item-Total Statistics

	MID	VID	CITC	AID
poly_1	39.35	61.36	.77	.90
poly_2	39.32	66.77	.39	.91
poly_3	39.08	66.14	.41	.91
poly_4	39.66	61.35	.73	.90
poly_5	39.85	62.24	.77	.90
poly_9	39.42	64.14	.60	.90
poly_10	39.54	63.05	.64	.90
poly_11	39.26	63.99	.68	.90
poly_12	39.62	61.32	.81	.90
poly_13	39.75	65.19	.58	.91
poly_14	39.72	62.82	.62	.90
poly_15	39.42	61.38	.74	.90
poly_16	39.09	64.90	.52	.91
poly_17	39.99	66.84	.41	.91

Note. MID = Mean if Item Deleted, VID = Variance if Item Deleted, CITC = Corrected Item-total Correlation, AID = Alpha if Item Deleted.

Table 8

Item-Total Statistics for TABP Measure

	CITC	AID
tabp_1	.06	.57
tabp_2	.12	.56
tabp_3	.09	.57
tabp_4	.15	.56
tabp_5	.12	.57
tabp_6	-.03	.59
tabp_7	.15	.56
tabp_8	.28	.54
tabp_9	.39	.52
tabp_10	.22	.55
tabp_11	.33	.53
tabp_12	.21	.55
tabp_13	.23	.55
tabp_14	-.08	.58
tabp_15	.17	.56
tabp_16	.22	.55
tabp_17	.30	.54
tabp_18	.27	.55
tabp_19	.20	.56
tabp_20	.25	.55

Note. CITC = Corrected Item-total Correlation, AID = Alpha if Item Deleted.

Appendix J

Content Validity Measure

As you are aware, polychronicity is a personal preference construct that describes an individual's preference for shifting attention among ongoing tasks, rather than focusing on one task until completion and then switching to another task. Please look over the attached measure of polychronicity, the POLY, and rate the extent to which the POLY reflects the expected content of this construct:

1. How much does the POLY reflect the content domain of polychronicity?

    1 = Very little or not at all

    2 = A little

    3 = Somewhat

    4 = Moderately

    5 = Very much

REFERENCES

Ackerman, P. L., Schneider, W., & Wickens, C. D. (1984). Deciding the existence of a time-sharing ability: A combined methodological and theoretical approach. *Human Factors, 26,* 71-82.

Benabou, C. (1999). Polychronicity and temporal dimensions of work in learning Organizations. *Journal of Managerial Psychology, 14,* 257-268.

Bluedorn, A. C. (1998). An interview with anthropologist Edward T. Hall. *Journal of Management Inquiry, 7,* 109-115.

Bluedorn, A. C., Kaufman, C. F., & Lane, P. M. (1992). How many things do you like to do at once? An introduction to monochronic and polychronic time. *The Executive, 6,* 17-26.

Bluedorn, A. C., Kalliath, T. J., Strube, M. J., & Martin, G. D. (1999). Polychronicity and the inventory of polychronic values (IPV): The development of an instrument to measure a fundamental dimension of organizational culture. *Journal of Managerial Psychology, 14,* 205-230.

Bühner, M., König, C., Pick, M., & Krumm, S. (2006). Working memory dimensions as differential predictors of the speed and error aspect of multitasking performance. *Human Performance, 19,* 253-275.

Cacioppo, J. T., & Petty, R. E. (1982). The need for cognition. *Journal of Personality and Social Psychology, 42,* 116-131.

Cacioppo, J. T., Petty, R. E., & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment, 48,* 306-307.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological Assessment, 7,* 309-319.

Conte, J. M., & Jacobs, R. R. (2003). Validity evidence linking polychronicity and Big Five personality dimensions to absence, lateness, and supervisory performance ratings. *Human Performance, 16,* 107-129.

Conte, J. M., Rizzuto, T. E., & Steiner, D. D. (1999). A construct-oriented analysis of individual-level polychronicity. *Journal of Managerial Psychology, 14,* 269-287.

Conte, J. M., Schwenneker, H. H., Dew, A. F., & Romano, D. M. (2001). Incremental validity of time urgency and other Type A subcomponents in predicting behavioral and health criteria. *Journal of Applied Social Psychology, 31,* 1727-1748.

Cotte, J., & Ratneshwar, S. (1999). Juggling and hopping: What does it mean to work polychronically? *Journal of Managerial Psychology, 14*, 184-204.

Damos, D. L. (1993). Using meta-analysis to compare the predictive validity of single- and multiple- task measures to flight performance. *Human Factors, 35*, 615-628.

Dawis, R. V. (1987). Scale construction. *Journal of Counseling Psychology, 34*, 481-489.

De la Casa, L. G., Gordillo, J. L., Mejias, L. J., Rengel, F., & Romero, M. F. (1998). Attentional strategies in Type-A individuals. *Personality and Individual Differences, 24*, 59-69.

Delbridge, K. A. (2000). Individual differences in multi-tasking ability: Exploring a nomological network. Unpublished doctoral dissertation.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (in press). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*.

Ferguson, G. A. (1949). On the theory of test discrimination. *Psychometrika, 14*, 61-68.

Glass, D. C. (1977). Stress, behavior patterns, and coronary disease. *American Scientist, 65*, 177-187

Gray, J. A. (1981). The psychophysiology of anxiety. In R. Lynn (Ed.), *Dimensions of personality*. Oxford: Oxford University Press.

Guion, R. M., & Gottier, R. F. (1965). Validity of personality measures in personnel selection. *Personnel Psychology, 18*, 135-164.

Hall, E. T. (1959). *The silent language*. Doubleday: Garden City, NY.

Hall, E. T., & Hall, M. R. (1990). *Understanding cultural differences*. Yarmouth, ME: International Press.

Humphreys, M. S., & Revelle, W. (1984). Personality, motivation, and performance: A theory of the relationship between individual differences and information processing. *Psychological Review, 91*, 153-184.

Ilgen, D. R., & Pulakos, E. D. (1999). Employee performance in today's organizations. In D. Ilgen & E. Pulakos (Eds.), *The changing nature of performance* (pp. 1-20). Jossey-Bass: San Francisco.

Ishizaka, K., Marshall, S. P., & Conte, J. M. (2001). Individual differences in attentional strategies in multitasking situations. *Human Performance, 14*, 339-358.

Jenkins, C. D., Zyzanski, S. J., & Rosenman, R. H. (1971). Progress toward validation of a computer-scored test for Type A coronary-prone behavior pattern. *Psychosomatic Medicine, 33*, 193-202.

Kaufman, C. F., Lane, P. M., & Lindquist, J. D. (1991). Exploring more than 24 hours a day: A preliminary investigation of polychronic time use. *Journal of Consumer Research, 18*, 392-401.

Kirmeyer, S. L. (1988). Coping with competing demands: Interruption and the Type A pattern. *Journal of Applied Psychology, 73*, 621-629.

König, C. J., Bühner, M., & Mürling, G. (2005). Working memory, fluid intelligence, and attention are predictors of multitasking performance, but polychronicity and extraversion are not. *Human Performance, 18*, 243-266.

Lance, C. E., Butts, M. M., & Michels, L. C. (2006). The sources of four commonly reported cutoff criteria: What did they really say? *Organizational Research Methods, 9*, 202-220.

LeBreton, J. M., Burgess, J. R. D., Kaiser, R. B., Atchley, E. K., & James, L. R. (2003). The restriction of variance hypothesis and interrater reliability and agreement: Are ratings from multiple sources really dissimilar? *Organizational Research Methods, 6, 80*-128.

Lieberman, M. D., & Rosenthal, R. (2001). Why introverts can't always tell who likes them: Multitasking and nonverbal decoding. *Journal of Personality and Social Psychology, 80*, 294-310.

Lundqvist, C. (2006). Competing under pressure: State anxiety, sports performance, and assessment. Unpublished doctoral dissertation.

McGraw, K. O., & Wong, S. P. (1996). Forming inferences about some intraclass correlation coefficients. *Psychological Methods, 1*, 30-46.

Murphy, K. R. (1996). Individual differences in organizations: Much more than *g*. In K. R. Murphy (Ed.), *Individual differences and behavior in organizations* (pp. 3-30). San Francisco: Jossey-Bass.

Onken, M. H. (1999). Temporal elements of organizational culture and impact on firm performance. *Journal of Managerial Psychology, 14*, 231-243.

Oswald, F. L., Hambrick, D. Z., & Jones, L. A. (2007). Keeping all the plates spinning: Understanding and predicting multitasking performance. In D.H. Jonassen (Ed.), *Learning to solve complex scientific problems*. Mahwah, NJ: Erlbaum.

Nunnally, J. (1978) *Psychometric Theory*. New York: McGraw-Hill.

122

Palmer, D. K., & Schoorman, F. D. (1999). Unpacking the multiple aspects of time in polychronicity. *Journal of Managerial Psychology, 14*, 323-344.

Persing, D. L. (1999). Managing in polychronic times: Exploring individual creativity and performance in intellectually intensive venues. *Journal of Managerial Psychology, 14*, 358-373.

Rubinstein, J. S., Meyer, D. E., & Evans, J. E. (2001). Executive control of cognitive processes in task switching. *Journal of Experimental Psychology: Human Perception and Performance, 27*, 763-797.

Salthouse, T. A., Hambrick, D. Z., Lukas, K. E., & Dell, T. C. (1996). Determinants of adult age differences on synthetic work performance. *Journal of Experimental Psychology: Applied, 2*, 305-329.

Slocombe, T. E. (1999). Applying the theory of reasoned action to the analysis of an individual's polychronicity. *Journal of Managerial Psychology, 14*, 313-322.

Slocombe, T. E., & Bluedorn, A. C. (1999). Organizational behavior implications of the congruence between preferred polychronicity and experienced work-unit polychronicity. *Journal of Organizational Behavior, 20*, 75-99.

Smither, J. W., Reilly, R. E., Millsap, R. E., Pearlman, K., & Stoffey, R. W. (1993). Applicant reactions to selection procedures. *Personnel Psychology, 46*, 49-76.

Stankov, L., Fogarty, G., & Watt, C. (1989). Competing tasks: Predictors of managerial potential. *Personality and Individual Differences, 10*, 295-302.

Szymura, B., & Necka, E. (1998). Visual selective attention and personality: An experimental verification of three models of extraversion. *Personality and Individual Differences, 24*, 713-729.

Szymura, B., & Wodniecka, Z. (2003). What really bothers neurotics? In search for factors impairing attentional performance. *Personality and Individual Differences, 34*, 109-126.