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THE IMPACT OF POLYCHRONICITY ON STUDENT PERFORMANCE IN DIGITAL TEST SITUATIONS

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Abstract

Polychronicity, an under-researched dimension of diversity, refers to the degree to which a person likes to engage in several tasks at once. While people differ regarding their preferences for engaging in multiple tasks simultaneously, jobs also differ in that some tend to require the successive completion of tasks, whereas others demand that the person's attention be divided among several activities at once. A body of literature which we have summarised has hypothesised, and to some degree empirically ascertained, that productivity gains also ensue from a person-job fit with respect to polychronicity. This would imply that as digitisation progresses and the demand for multitasking in the workplace continues to rise, polychrons will increasingly be sought on the labour market.
This paper adds to that literature by testing, among a group of undergraduate students, the performance effects of the interaction between polychronicity and a digital task design. While one half of the students were randomly assigned to a set of tasks that was to be completed sequentially, the other half were given the choice of how to allocate their limited time across the set of tasks, and in what order. While falling short of downright multitasking, as employed by most prior studies, the latter setup allowed the students to jump back and forth between the individual tasks, which should cater to the preferences of polychrons.
We found that this more flexible task arrangement improved average performance across the board, i.e., irrespective of the degree of polychronicity. At the same time, however, performance was also significantly higher when there was a match between time style and task type, i.e., when monochrons were given the sequential tasks and polychrons the flexible, simultaneous task structure.

Keywords: *Monochronicity, polychronicity, performance, person-job fit, multitasking.*

1. Introduction

The anthropologist Edward T. Hall (1959) coined the terms *monochronic* and *polychronic* for a particularly insightful dimension along which we may conceptualise human attitudes towards time. Monochronic persons ('monochrons') or cultures tend to approach tasks sequentially, beginning the next one only after the first one has been completed; they have a mechanistic concept of time and value punctuality and planning. At the other end of this spectrum, polychronicity refers to an attitude where time is viewed as fluid, being associated not so much with clocks but more with states and processes of nature. To polychronic persons ('polychrons'), punctuality is less important than building and maintaining relationships, and they tend to address several tasks simultaneously, freely and spontaneously jumping back and forth between them without a strong need for immediate closure.

A person's degree of monochronicity or polychronicity – their *time style* or *time personality* (Lindquist/ Kaufman-Scarborough, 2007) – will determine their actions and wellbeing in all areas of life, but perhaps nowhere as acutely as in the workplace, where time – the proverbial equivalent of money – is usually the scarcest resource. And just as humans differ in the way they approach time and tasks, so do the tasks themselves. Sometimes a set of tasks must be completed in a given order, with no room for digression or spontaneity. This is typically the case, for example, when the individual tasks built upon one another, making it imperative that the first one be completed before the next one is begun. We might refer to this as a *sequential* task structure. At other times, however, the order in which we address and complete a set of tasks will not matter, so we are free to devise our own work schedules and revise or abandon them as we please – or as the circumstances demand. Indeed, efficiency and/or effectiveness may require that we engage in several tasks at once and constantly adjust their order of priority as contingencies arise.

Examples of such *simultaneous* task structures abound in modern working environments: the original task is interrupted by an urgent new email, whose processing is in turn interrupted by a phone call, etc.

It seems natural to expect that a worker's productivity and well-being will benefit from a *match* between her *time style* and the *task type*, which in the literature is also known as a *person-job fit*, i.e. a monochronic person facing sequential tasks or a polychronic person facing simultaneous tasks. Hence, investigating this hypothesis should be in the interest of a wide range of social sciences, including anthropology, sociology, cultural studies, psychology and management. The present paper focuses on the performance effect of a person-job fit with respect to polychronicity, on which surprisingly little research has been done so far. This lack of evidence is all the more remarkable since matches between time style and task type are not random occurrences in life; often they can be *created* by mindful employees, recruiters, supervisors, etc. We often have a choice about the task structures that we want to tackle (employee's perspective, e.g. when choosing a career) or whom to give a certain task (employer's perspective, e.g. in recruitment). If a systematic performance premium indeed exists, much is to be gained by better understanding a person's time style and making an effort to ensure her tasks accord with her inherent, culturally- and personality-driven attitudes to time and work.

To test for any productivity effect of the match between time style and task type, we conducted an online experiment among German undergraduate students of Human Resource Management. To ascertain the students' time styles, we applied a rudimentary two-item instrument based on Kaufman-Scarborough/ Lindquist (1999). The students were presented with either of two versions of a set of tasks. The first version catered more to a monochronic time style, whereas the other version was rigged to be more amenable to polychronic students. This setup allowed us to check for any systematic performance advantage in case of a match between time style and task type.

2. Research design

All students enrolled in the 2021 class of the undergraduate course "Human Resource Management" at the University of Hamburg, Germany, were invited by email to fill in an online questionnaire that would test their understanding of the material learnt so far. They were told that this exercise would help them prepare for the upcoming exam and at the same time provide the basis of a social science experiment with some relevance to the aims of the course. Some 400 students were invited; about 150 entered some data, of whom 127 provided a sufficiently complete set of information to be included in the analysis. The participants' age range was 19 to 37 years, except for one outlier at 44 years, and the median was 23 years. Around 70% of the students were female.

The questionnaire comprised two parts. Part 1 contained ten revision questions relating to the course material. Five response options were given for each question, one of which was correct. The total number of correct responses submitted by each student constitutes our measure of PERFORMANCE, the dependent variable in the subsequent analysis. The students were given eight minutes to complete Part 1. Considering that there was a fair amount of text to be read and the alternative response options for each question were quite similar, this time limit was reasonably tight, the intention being to create an element of pressure so that time management and time styles become relevant to performance. The passage of time was indicated by a progress bar at the top of the page.

There were two variants of Part 1, among which the participants were distributed at random. In Part 1M ('mono'), each of the ten questions was displayed on a separate page, so that the students were forced to work through the tasks sequentially, in the given order. The questionnaire allowed the students to proceed to the next question but not to go back, and the students knew this before launching into the first question. That way, the students had to decide how much time to allocate to a question without knowing whether the remaining questions would be more or less difficult. This design of Part 1M was intended to be more amenable to monochronic time styles, or at least to prevent students with more polychronic styles to play to their strengths.

By contrast, Part 1P ('poly') of the questionnaire was designed to better accommodate a polychronic time style. All ten questions were displayed on a single page, so the students were able to scroll up or down to preview or revisit the questions as they pleased. Again, the students were made aware of the setup on a start page that preceded the questions. For those who preferred such a workstyle, this presentation of the task held a substantial benefit: It allowed them to make an initial assessment of the difficulty of each question, then to answer the easy ones (the 'low-hanging fruits') first, and finally to spend whatever time was left on the more difficult questions. On the downside, the students were at risk of dedicating so much time to devising their time management tactic (previewing the questions, re-reading them in a second pass, scrolling back and forth) that not enough time was left to think about the actual substance of the task.

Having completed either Part 1M or Part 1P of the questionnaire, all students were forwarded to Part 2, which asked them for a set of socio-demographic details that might be relevant to their performance regarding Part 1. Finally, the questionnaire asked the students to indicate to what extent they agreed with the following statements (in German):

1: "Sometimes during the day, I am not sure what to do next."
2: "Changes in my schedule upset me."

These are two items from a much longer list of statements whose responses Kaufman-Scarborough/Lindquist (1999) showed to correlate with polychronicity – positively in the case of the first statement, and negatively in the case of the second. In our sample, as expected, there is a strongly significant, negative correlation ($r = -0.31$) between the responses to these two statements, which provides some support for the viability of our instrument of time styles. For our preliminary study, we preferred a small number of statements in order not to overtax the students' patience (Kaufman-Scarborough/ Lindquist (1999) themselves used a three-item instrument of polychronicity.) We selected these two items because, unlike the other suggested items, they are not too closely related to the test situation at hand, and so there was less risk of endogeneity – the students selecting their responses to the statements under the impression of their recent experience of Part 1.

Agreement with the statements was to be indicated on a five-point Likert scale, which we translated into values of -2 to 2. By subtracting the value of agreement to the second statement from the value of agreement to the first statement, we formed POLY, a measure of how strongly a student is associated with a polychronic time style. Our hypothesis thus suggests that students with high POLY scores should perform better when faced with the simultaneous task (Type 1P) and less well when allocated to the sequential task (Type 1M).

3. Results

For a first glance at the results, we divided the POLY spectrum into quartiles and compared only the first (strong monochronicity) and the fourth (strong polychronicity) quartile. Goonetilleke/Luximon (2010) use a similar strategy of comparing extremes in terms of time styles. Table 1 shows the resulting subsample averages for PERFORMANCE by task type.

Table 1. Subsample means of PERFORMANCE by task type and POLY quartiles.

PERFORMANCE averages		POLY score		
		first quartile	fourth quartile	total
Task type	sequential	3.714	3.118	3.486
	simultaneous	3.611	4.333	4
	total	3.656	3.688	3.724

In support of our hypothesis, the polychrons outperformed the monochrons when facing the simultaneous task, i.e. when there was a person-task fit, and the monochrons did better than the polychrons on the sequential task – the other type of fit. When we combine the two subsamples that exhibit a match and compare them to the two non-match groups, the difference in average performance scores – 4.03 vs. 3.37 – is pronounced but not statistically significant.

While intuitive and insightful, the comparison of means does not account for the potential influence of any other variables. Controlling for such influences calls for a multivariate regression model with PERFORMANCE as the dependent variable. The results of that model are reported in Table 2. PART_1P is a dummy variable that equals 1 if a student was assigned the version of the questionnaire that permitted a polychronic working style, as opposed to the sequential presentation of the questions. We see that those students who were allowed to tackle the tasks in an order of their choosing and to freely allocate their time among them tended to do better – by almost 0.8 correct answers.

To test our main hypothesis, the model includes the explanatory variable MATCH, which indicates the degree to which a student experienced a person-task fit in terms of polychronicity: MATCH simply equals POLY in case the student in question was assigned questionnaire Part 1P, i.e., the layout that should be more amenable to polychrons. In that case, a high value of POLY directly translates into a high value of MATCH – the person in question prefers a polychronic style, and she happened to receive the corresponding task type, so there is a match. For monochrons who were assigned Part 1P, MATCH

will be low, as time style and task type do not match. Conversely, for those students who were assigned Part 1M, the monochronic task type, MATCH equals the negative value of POLY, by the same logic. In sum, MATCH is our measure of the strength of the fit between time style and task type. Our hypothesis thus suggests that we should see a positive correlation between MATCH and PERFORMANCE.

The results do confirm this, the regression coefficient being significant at the 5%-level. However, this estimate is quite sensitive to specification changes. Furthermore, the overall explanatory power of the model is modest, so this result should be considered indicative at best.

Among the additional control variables, DELAY stands out for its highly significant effect. The variable refers to the number of days that a given student submitted her questionnaire after the very first questionnaire in the class was submitted. It appears that those students who submitted late – immediately prior to the exam – tended to be those who followed the course more diligently. A_LEVELS and ENTRY_TEST are proxies for the students' prior qualifications. GRANDPARENTS refers to migration background, representing the number of a student's grandparents who were born in Germany. Finally, LANGUAGE refers to the degree to which a student felt that her command of the German language may have impeded her understanding of the test questions. Surprisingly, those who were challenged in terms of language tended to do better in the test; however, the result is not significant.

Table 2. Regression results to explain PERFORMANCE.

Variable	**Coefficient**	**t-Statistic**
PART_1P	0.768	2.145**
MATCH	0.665	2.023**
DELAY	0.076	2.566**
A_LEVELS	2.19	1.955*
ENTY_TEST	1.969	1.499
GRANDPARENTS	0.173	1.449
LANGUAGE	1.045	1.397
Observations	127	
R^2	0.1494	
Poisson regression. Constant term included but not reported. */** indicate significance at the 10%-/5%-level.		

The regression confirmed that polychrons tended to perform slightly better than monochrons, by about a quarter of a point (not reported in the table). However, this difference is again not significant.

4. Conclusion

A good person-job fit – where 'job' may refer to any variety of organised human endeavour, also beyond the labour market – has been widely shown to yield considerable psychological and productivity benefits. Since one person's productivity and well-being has strong positive externalities, these benefits accrue not just to the person in question but also to those around her: most evidently her supervisor, her colleagues and the organisation's stakeholders, but also to more distant parties. Accordingly, there are strong incentives to achieve such a fit. The preconditions for that may sound obvious, and yet they are anything but trivial in practice: to know what the job requires and what the person has to offer.

Of the countless dimensions of human diversity that will determine the quality of such a fit, this paper has focused on time styles or, in Hall's (1959) original terms, a person's degree of monochronicity versus polychronicity. While people differ regarding their preferences for engaging in multiple tasks simultaneously, jobs also differ in that some tend to require the successive completion of tasks, whereas others demand that the person's attention be divided among several activities at once. A body of literature has hypothesised, and to some degree empirically ascertained, that productivity gains also ensue from a person-job fit with respect to polychronicity. This would imply that as digitisation progresses and the demand for multitasking in the workplace continues to rise, polychrons will increasingly be sought on the labour market.

This paper adds to that literature by testing, among a group of undergraduate students, the performance effects of the interaction between polychronicity and a novel task design. While one half of the students were randomly assigned to a set of tasks that was to be completed sequentially, the other half were given the choice of how to allocate their limited time across the set of tasks, and in what order.

While falling short of downright multitasking, as employed by most prior studies, the latter setup allowed the students to jump back and forth between the individual tasks, which should cater to the preferences of polychrons.

We found that this more flexible task arrangement improved average performance across the board, i.e., irrespective of the degree of polychronicity. At the same time, however, performance was also significantly higher when there was a match between time style and task type, i.e., when monochrons were given the sequential tasks and polychrons the flexible, simultaneous task structure. Since these results are not overly robust with respect to specification changes, they have only exploratory value and require confirmation through additional, larger-scale research, which could also address the present study's limitations.

Some of these limitations concern the sample we employed. The fact that only about a third of the invited students actually participated left room for self-selection. While this need not cause bias in the results, it limits their generalisability. Furthermore, most of the students were socialised in Germany – a predominantly monochronic culture, according to Hall's original categorisation. This means that the polychronic end of the time style spectrum was likely underrepresented. However, even if we had drawn our sample from different universities throughout the world, it would still be limited to students, who differ systematically from the general population, especially with regard to time styles (Poposki/Oswald, 2010). Other limitations concern our choice of a somewhat rudimentary, two-item instrument, and the simple nature of the task structure, which did not test a wide range of skills. Different choices with respect to these and other aspects of the experimental design would likely have yielded clearer results.

What can we take away from the preliminary results of this study? While the performance effect of the person-job fit in terms of polychronicity requires further confirmation, there are nevertheless strong reasons for all parties involved to aim for such a fit wherever the opportunity arises: the benefits of well-being, for example in the form of reduced stress, are undisputed (e.g. Hecht/Allen, 2005; Poposki/Oswald, 2010; Wu et al., 2020). Therefore, anyone who is in a position to match tasks to persons will do very well to think carefully about the needs, abilities and requirements of both sides of the match, which includes intuiting or more formally eliciting the person's degree of polychronicity. Wherever possible, the persons facing the tasks should be allowed to self-select, as they will – or should – know best which tasks or jobs suit their individual time styles. Anyone who is unaware of their own preferences can resort to one of the polychronicity measures. Accepting and appreciating the different time styles as another important dimension of human diversity can thus help to bring out the best in employees, in students or, more generally, in people.

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