

Multiple Intelligences, Chronic Relative Underperformance Risk and the Perception of the Organizational Creative Environment: Exploratory Correlational Study at Single Employer in the Netherlands

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Abstract

Creativity is important within knowledge-intensive organisations. In this article, we research the relations between profiles of multiple intelligence and how employees assess their organisation as supporting creativeness. Multiple intelligences theory is important because it takes a more humanistic approach to skills, abilities and talents, in recognising that there is more to a human than the skills appreciated in classical g-theory. We are interested in whether different types of people look differently upon the organisation in this regard. Special attention is given to employees whose multiple intelligence profile is higher than required for their job, a misfit inducing risk for chronic relative underperformance, and how this misfit relates to the assessment of the work environment. Data collection was done in a large institute for mental health care in the Netherlands. On a voluntary basis, employees were assessed on their personal multiple intelligences profile using the MIDAS® questionnaire. They simultaneously assessed their organisation on supporting creativity, using the KEYS® to Creativity and Innovation questionnaire. The data were analysed in three ways (1) by correlating the values of their multiple intelligence with the assessment on creative climate; for this 189 records could be used, (2) by computing the risk of chronic relative underperformance, and correlating this with creativity climate; for which 147 records of mental health workers remained for the analysis; and (3) investigating whether there was a difference in scores when the

results were grouped by highest or lowest intelligence.

Results show that there is mild support for our expectation that multiple intelligences matter and that employees with profiles that are high on intelligences not required for the job assess the work environment as less beneficial for creative output. It is concluded that organisations (which consist of a spectrum of differently profiled humans) may benefit from taking into account these differences within their workforce. Limitations to the study design are also discussed.

Introduction

Creativity is an important asset in organisations; innovation depends on it (Amabile, 2006; Amabile et al., 1996; Mumford & Simonton, 1997). The subject of interest in this article is Multiple Intelligences (MI) as intelligence, skills and abilities representations, and how differences in profiles of multiple intelligences relate to what people perceive in their organisation as supporting or hampering creativeness in their organisation. The multiple intelligences theory breaks away from the classical way of looking at intelligence and redefines it as "an ability to solve problems, make products, or rendering services, that are valued within a community" (Gardner, 1983), and is essential for our purposes because it covers the whole range of a person's abilities, instead of a subset. The question we explore in this article is whether people with different 'profiles of intelligence' need different things from their work context. We study whether these different needs manifest themselves in how they perceive the organisation as supporting these needs. This leads to the following statement we want to explore:

Individuals with different multiple intelligence profiles perceive the organisational climate regarding support of creativity differently.

According to Mumford & Simonton (1997), creativity and innovation are essential requirements for organisational success, especially in a dynamic global economy. However, they say creativity has not been seen as a factor to include when designing an organisation. Creativity is not only a personal thing, but it has to land within the right conditions to make innovation possible (Amabile, 2006). Gardner (1993) states that you can only be creative in a domain once you have attained a level of proficiency. People working in organisations have all kinds of attributes, some are necessary for their jobs, others are less so, in some cases they have too high a level of specific attributes, and sometimes they can just cope. So for each person, there is a fit between their jobs and their attributes, which is partly captured by the Person-Environment Fit theory by Edwards and co-

workers (Edwards et al., 1998; Edwards & Shipp, 2007).

To be creative, employees need to be proficient. They must have higher skills and abilities to solve problems, make products or deliver services within the domain; or in other words, they must be more intelligent in it, following the definition of intelligence within the multiple intelligences theory (Gardner, 1983, 1993, 2002). Multiple intelligences theory states that there is more to intelligence than those abilities measured by traditional IQ tests, and Gardner (1983) stated that there are several intelligences, set eight criteria for a set of abilities to constitute an intelligence, and based on this, he proposed eight intelligences (Gardner, 1983, 1993). These are described in Table 1. Two of the criteria are that the intelligence must be independent of all others and that there must be an evolutionary value for the intelligence. These two criteria, and the fact that over the years no other candidates beyond the eight mentioned have qualified (such as creative intelligence, spiritual intelligence [see Gardner, 2000]), existential intelligence), suggests that everything we do in life (including work) is done using a combination of the eight intelligences now included in the model. This is the main reason we use the multiple intelligences theory: employees are much more than the sum of skills needed for their jobs, and we are interested in whether this 'more' influences their (perception of their) jobs. Using MI, we can gain some insight into the whole range of skills necessary for human survival (blinded_3, 2016) in relation to work variables, and not only on specifically selected job-related skills, which is why the MI theory is important.

Table 1. *Description of the eight intelligences in Gardner's Theory*

Intelligence	Description
Linguistic	To think in words and to use language to express and understand complex meanings. Sensitivity to the meaning of words and the order among words, sounds, rhythms and inflections. To reflect on the use of language in everyday life.
Logical-Mathematical	To think of cause and effect connections and to understand relationships among actions, objects or ideas. To calculate, quantify or consider propositions and perform complex mathematical or logical operations. It involves inductive and deductive reasoning skills as well as critical and creative problem-solving.
Visual-Spatial	To think in pictures and to perceive the visual world accurately. To think in three dimensions and to transform one's perceptions and re-create aspects of one's visual experience via imagination. To work

Intelligence	Description
	with objects effectively.
Musical	To think in sounds, rhythms, melodies and rhymes. To be sensitive to pitch, rhythm, timbre and tone. To recognize, create and reproduce music by using an instrument or voice. Active listening and a strong connection between music and emotions.
Kinesthetic	To think in movements and to use the body in skilled and complicated ways for expressive and goal directed activities. A sense of timing, coordination for whole body movement and the use of hands for manipulating objects.
Interpersonal	To think about and understand another person. To have empathy and recognize distinctions among people and to appreciate their perspectives with sensitivity to their motives, moods and intentions. It involves interacting effectively with one or more people in familiar, casual or working circumstances.
Intrapersonal	To think about and understand one's self. To be aware of one's strengths and weaknesses and to plan effectively to achieve personal goals. Reflecting on and monitoring one's thoughts and feelings and regulating them effectively. The ability to monitor one's self in interpersonal relationships and to act with personal efficacy.
Naturalistic	To understand the natural world including plants, animals and scientific studies. To recognize, name and classify individuals, species and ecological relationships. To interact effectively with living creatures and discern patterns of life and natural forces.

Note: Adapted from Shearer (1996).

Multiple intelligences theory has been used within organisational sciences and applied to the workplace (Gale, 2013; Green et al., 2005; Hoffman & Frost, 2006; Lane, 2009; Martin, 2003; Noruzi & Rahimi, 2010; Vincent et al., 2002) and has found its way to counselling (Booth & O'Brien, 2008; Pearson et al., 2015; Shearer & Luzzo, 2009) and therapy (Pearson, 2011). The interpersonal and intrapersonal intelligence aligns to concepts such as emotional intelligence or personal intelligence (Mayer et al., 2018; Park & Park, 1997), and even mentalisation (Fonagy et al., 2004) has overlap with these two intelligences. Gardner's theory has been taken on mostly within the field of education (see Gardner, 2009)

To be useful to the organisation, employee creativeness must be allowed to express itself. This is not only something that the person does (non-cognitive personality factors) but is influenced by the environment in which he exists. This means that in a work environment, there are aspects that hamper or support the use of creativeness; there is a climate (or culture) of support for creativity. The characteristics of the work environment hampering or stimulating creative expression – the creativity supporting climate –, are described in Amabile's Componential Model of Organizational Innovation, as 1) the organisational motivation to innovate, 2) resources provided or not, and 3) the management practices (Amabile, 2004). How the organisational climate is perceived goes through the filter of coping and defence. We think that the intelligences influence this because these are the skills people use to solve problems; coping and defence skills depend on intelligences.

There are several ways to describe the different profiles of multiple intelligences. One way is ordering the intelligences from high to low. Gardner (1993, p. 36) describes laser and searchlight profiles. It is helpful to look at the peaks and bottlenecks in the profile, and that people with for instance a peak on the linguistic intelligence may be different from someone who has the musical intelligence as his highest ability. Another way of looking at a profile is to compare the highs and lows in it with the job demands and what they might have in surplus or shortage.

We think that the different dimensions of intelligences can possibly influence the view of employees on the organisation being supportive of employee creativity, leading to the .

Research Question: Are different dimensions of intelligence, as defined by the multiple intelligence theory, associated with different perceptions of the organisational climate as defined by the level of organizational support for employee creativity?

Chronic Relative Underperformance

Motivation to do things, such as work, has both an intrinsic and an extrinsic component. The fact that there is an overlap between the Componential Model and high giftedness on creativity (blinded_1, 2020; preprint) is of significance in this regard. High gifted people are often performing below the level they might be capable of, even though they may be performing well enough according to what is expected from them according to the job requirements. Many problems gifted people have with their work are related to the fact that jobs 'cater to people with an average intelligence' (van der Waal et al., 2013, p. 166). Moreover, this is probably not only true for high gifted people but possible for all employees who may have capabilities or talents exceeding what their jobs ask for or even not deemed of any use to their job. There is a (possible) job-person misfit (blinded_5, 2020).

Table 2*Job Profile and individual profile in multiple intelligences*

Intelligence	Job Profile	Example personal profile
Interpersonal	78	68
Intrapersonal	76	60
Linguistic	70	64
Logical/Mathematical	45	39
Kinesthetic	24	55
Musical	22	29
Naturalistic	20	58
Visual/Spatial	17	38

Note: adapted from blinded_4 (2015, p. 30)

An example of a job profile for mental health workers is presented (see Table 2), for which the eight intelligences mentioned in Table 1 are used, and an example personal profile illustrating the job-person misfit. Comparing these two profiles is not straightforward, even though both use the same underlying concept. The questionnaires on which they are based, however, have different psychometric properties. Both are percentage scales ranging from 1 to 100 with higher scores meaning that more of it is present or needed, but 70 on the one profile does not exactly mean the same on the other (blinded_2, 2020, preprint). However, what can be observed is that the mental health worker profile (MHWP) scores relatively high on three intelligences: interpersonal, intrapersonal and linguistic (one would expect this, based on common sense – dealing with psychological problems involves knowledge of your own mind, dealing with those of others, mainly using language in working this through), in the middle on logical/mathematical, and low on visual/spatial, kinesthetic, musical, and naturalistic. In the personal profile, what stands out is especially the differences for the kinesthetic and the naturalistic scales. These might be talents, or capabilities that need to be expressed, that are not tapped into in the work environment, which might lead to subconscious dissatisfaction and hamper the employee's effectiveness. Thus, this situation – when it lasts –, may become problematic, has been called Chronic Relative Underperformance (CRU), and may lead to boredom, and at a certain point even to boreout (blinded_5, 2020). This makes it important to gain more insight into CRU; when this risk can be assessed, it might be possible to prevent the detrimental effects.

Using the MHWP and comparing this to individual profiles may give some insight into whether a person has capabilities beyond what is needed for his or her job, it cannot establish whether the person in question is in the chronic relative underperformance state (CRU). Therefore, we expect that there is more risk for chronic relative underperformance as the discrepancy is greater. We, therefore, expect that when this risk gets higher, employees perceive the organisation

differently, which leads to the following presumption:

How individuals perceive the organisational climate on support for creativeness is related to how much of their capabilities are left unused; presumably, the more capabilities and the extent in which they are left unused, the more negative the individual will regard the climate on support for creativeness.

Methodology

This research analysis data in order to explore whether the expectations we have regarding that the different intelligences are related to how employees see their organisations, and especially that in those cases where strengths they have are not used within their work are related to negative evaluations of their work environment, have any merit.

Operationalisation: Multiple Intelligences

For the assessment of the multiple intelligences profiles, we use the MIDAS® (Shearer, 1996). This is an 119 items self-report questionnaire with Likert type scales, ranging from 0 to 4 and an 'I don't know' category. The scales are computed as percentage scales, and there are no norms applied. During the development of the scales, the answering categories were adjusted so that the average score over large samples for the scales would be around 50%. This means that for each item, the wordings of the answering categories may differ. The MIDAS® has been translated into several languages (e.g. Dutch, Spanish, Chinese, Farsi, Turkish) and has been researched on reliability and validity (Ostvar et al., 2012; Saban et al., 2012; Shearer, 1996).

The multiple intelligences are the main scales that the MIDAS® assesses. Using factor analysis, different subscales have been described (Shearer, 1996). It is described that a person can have a result of around 50% on a main scale, and have highly fluctuating results in the subscales comprising that main scale. For instance, the main scale Musical consists of the subscales musical appreciation, playing an instrument, vocal, and composing. It may be the case that someone has never played an instrument or composed music but sings a lot and listens to music all the time. Therefore, it is not only interesting to see if the main scales show any relationship with the perception of the creative climate but also to go down one level deeper. For a complete list of the main scales and subscales of the MIDAS®, see Appendix A.

Operationalisation: Risk for Chronic Relative Underperformance

To compute the Risk for Chronic Relative Underperformance (rCRU), the method described by blinded_2 (preprint) is used. Although it might be tempting to just order the scales compared to the job-profile and only use z-scores to compare them, this does simplify matters too much, as argued by blinded_2 (*ibid.*). To apply the proposed method, the data obtained by the MIDAS® are compared with the mental health care job profile in multiple intelligences (MHWP – mental health worker profile), provided by blinded_4 (2015). The method computes a Mahalanobis distance (Mahalanobis, 1936) for the MIDAS®-scales higher than the profile to be compared against (plus), and for those lower than the profile expects (min). The Mahalanobis distance takes the correlations between the multiple intelligences into account in determining the distance between them. Individuals with a higher mean distance on the plus-scales are considered more at risk of Chronic Relative Underperformance. This article is the first one using this index, and therefore it is relevant to look more closely at how it, and the components of which it is computed, behave. Regarding how this research question has been worded (higher rCRU leads to negative effects), it makes more sense to look at only the plus scales because that gives the index on the abilities left underused. Since this is exploratory, we will also look at the other side of the coin as well – the risk of being over-challenged.

The potential risk of Chronic Relative Underperformance is that when some abilities or skills are not asked for in the job, this negatively affects outcomes, such as productivity or sickleave. The KEYS® variables are all constructed in such a way that higher means a positive influence. Another way to operationalise rCRU is to divide the subjects into two groups, a) those who have one of the essential MI's as their high peak intelligence (intrapersonal, interpersonal and linguistic), and b) those with the peak intelligence in one of the remaining MI's, the last group being those at risk for CRU. For all of the KEYS® variables, the expectation is that this last group will score lower than the first group.

Operationalisation: Assessment of the organisational climate on creativity

The KEYS® to Creativity and Innovation is a tool developed by the group of Amabile to identify the factors that support or inhibit innovation and creativity in an organisation (Amabile, 1995; Amabile et al., 1996). It is a Likert-type questionnaire, in which employees rate their team and their entire organisation on several aspects, leading to measurements on: (1) management practices that impact innovation, (2) the organisational stance on creativity and resources, and (3) a quantification of how productivity and creativity are perceived in an organisation.

Table 3
Variables obtained with the KEYS® questionnaires

Aspect	Variable	Description
Management practices	Freedom	The sense of control over one's work; or deciding what or how to do your work
	Challenging work	The sense of having challenging tasks and working on important projects.
	Managerial encouragement	The sense that the boss gives a good role example, sets appropriate goals, supports the workgroup, values individual contributions, and shows confidence in the workgroup.
	Work group supports	The sense that the employee is working in a diverse group, in which people communicate well, are open to new ideas, and constructively challenge each others work.
Organisational motivation	Organisation encouragement	Involves the fair and constructive judgment of ideas, reward and recognition for creative work, mechanisms for developing new ideas, an active flow of ideas, and a shared vision
	Lack of organisational impediments	Reflects how the culture in the organisation is perceived by the employee as not impeding creativity because of internal political problems, harsh criticism of new ideas, destructive internal competition, avoidance of risk, and overemphasis on the status quo.
Resources	Sufficient resources	The sense that there is access to appropriate resources, including funds, materials, facilities, and information.
	Realistic workload pressures	An absence of extreme time pressures, unrealistic expectations for productivity, and distractions from creative work.
Outcomes	Creativity	
	Productivity	

Note: adapted from Centre for Creative Leadership, 2010.

Data collection

To explore our suppositions, we collected data from the employees of a large mental health organisation in the Netherlands, as an example of a non-profit knowledge-intensive organisation, using questionnaires. On the intranet, announcements had been made as to the global purpose of the

project – researching the effects of underusing the talents of employees –, and it was made abundantly clear that participation was entirely voluntary. To include the data from a subject into the sample, he/she should have completed two online questionnaires 1) the MIDAS® (Shearer, 1996), and 2) the KEYS® (Amabile, 1995). Both questionnaires were presented separately but at the same time, so results could not have been influenced by the passing of time or interventions made based on the questionnaire results. Each participant completing the MIDAS® automatically received a report on his multiple intelligences profile and was offered the possibility to follow a workshop on how to interpret the profile and how to use this for personal development. These were given after the closing time of the data collection. The data were aggregated and analysed using the R statistical language within the RStudio tool.

From the 951 employees approached, 241 completed the MIDAS® and 351 completed the KEYS®. Of these, 189 could be matched; the rest did not complete the MIDAS® or the KEYS®. For exploring our expectations regarding the Risk of Chronic Relative Underperformance, we needed the included persons to have a mental health function; after removing all non mental-health care worker functions, a sample of 147 observations remained.

Model and statistical hypothesis

For the expectation about different MI profiles and different perceptions of the work environment, we use a correlational design. Because of how the data were obtained, it will not be possible to make any causal statements. The theory so far does not generate hypotheses regarding the direction of the relations between multiple intelligences and the perception of the work environment. The nature of the research question is exploratory, and therefore a two-sided test of correlation is chosen with an α of 5%.

Computing correlations between the variables is one way to test whether different profiles fluctuate with different levels of appreciation of the work environment. In this way, each intelligence is assessed on its own and not in relation to 'a profile with weaknesses and strengths'. So, do people with intelligence x as the highest differ from those with one of the other intelligences as the highest. For our purposes, this will be the operationalisation of the 'laser-point' in the profile, even though this does not correspond for all profiles with the definition of a laser profile as meant by Gardner (2002). To test the differences between 'high point/laser point intelligence' and for the 'bottleneck intelligence', the data are categorised in two times eight groups, according to the highest scoring and the lowest scoring intelligence, and we test whether the means of the groups differ from each other using the t-test for independent samples, with an α of 5%.

For the research question on rCRU, we expect that when the risk gets higher, that the work environment is evaluated as more poorly. The statistical hypotheses, for all relations in the correlational matrix between rCRU and the KEYS® variables, is a one-sided test, also at an α of 5%, where we expect the correlations to be negative.

The differences between the subjects having their highest intelligence in the 'used' versus in the 'unused' group on the KEYS® variables will be tested one-sided with the t-test for independent samples, at an α of 5%, where we assume that the scores are lower for the subjects having their highest intelligence in the 'unused' intelligences.

Results

Multiple Intelligences and perception of the environment

The Pearson correlation matrix between the MIDAS® variables and the KEYS® consisted of 340 correlations, of which 70 are significant on at least the 5% level (see appendix B, table 1)

, which roughly means that 17 might be the result of chance, though we do not know which ones. All but one are to be categorised as weak (Akoglu, 2018), ranking from a high of $r = .49$ to a low of $r = .14$. In table 4, the correlations are shown for the MIDAS® main scales and the ten factors or organisational support of creativeness. To give some intuitive sense of importance, the eight intelligences are ordered according to their importance for working in a mental health organisation (blinded_4, 2015).

Table 4

Pearson correlations between MIDAS® main- and subscales and the KEYS®

	Freedom	Challenging work	Managerial encouragement	Workgroup support	Organizational encouragement	Lack or organizational impediments	Sufficient resources	Realistic workload pressure	Creativity	Productivity	# significant
INTERPERSONAL	.01 (.85)	.28** (.00)	.06 (.43)	.10 (.18)	.01 (.93)	-.14 (.05)	-.03 (.71)	-.09 (.22)	.26** (.00)	.10 (.17)	2
INTRAPERSONAL	.14 (.06)	.34** (.00)	.03 (.69)	.08 (.25)	.01 (.94)	-.21** (.00)	.04 (.60)	-.16* (.03)	.28** (.00)	.15* (.04)	5
LINGUISTIC	.03 (.64)	.20** (.01)	-.05 (.53)	.03 (.65)	-.09 (.20)	-.09 (.20)	-.04 (.55)	-.20** (.01)	.16* (.03)	.00 (.98)	3
LOGICAL-MATHEMATICAL	.04 (.63)	.15* (.04)	-.03 (.65)	.02 (.80)	-.09 (.22)	-.25** (.00)	-.02 (.79)	-.21** (.01)	.16* (.03)	.07 (.35)	4
KINESTHETIC	.00	.05	-.10	-.03	-.08	-.16*	.01	.01	.11	-.03	1

	Freedom	Challenging work	Managerial encouragement	Workgroup support	Organizational encouragement	Lack or organizational impediments	Sufficient resources	Realistic workload pressure	Creativity	Productivity	# significant
MUSICAL	(1.00)	(.49)	(.19)	(.71)	(.28)	(.03)	(.91)	(.93)	(.13)	(.70)	0
	-.05	-.05	-.03	.01	-.10	-.11	-.03	-.08	.05	.10	
	(.53)	(.53)	(.68)	(.90)	(.18)	(.13)	(.66)	(.27)	(.47)	(.19)	
NATURALISTIC	.02	.04	.02	.02	-.03	-.09	-.15*	-.21**	.07	-.10	2
	(.81)	(.61)	(.83)	(.80)	(.70)	(.22)	(.04)	(.00)	(.38)	(.17)	
VISUAL-SPATIAL	.03	.19*	.06	.09	.05	-.17*	-.05	-.18*	.25**	.08	4
	(.72)	(.01)	(.42)	(.20)	(.54)	(.02)	(.53)	(.02)	(.00)	(.29)	
Note: N=189.											21
**. Correlation is significant at the 0.01 level (2-tailed).											
*. Correlation is significant at the 0.05 level (2-tailed).											

From all the MIDAS® main scales, the intrapersonal intelligence comes up most frequently (5 out of 10), and the intrapersonal: personal knowledge subscale surfaces the most (6 out of 10). Below we will describe the variables which have a significant correlation from the perspective of the work environment variables.

Freedom: None of the intelligences show significant relations with the sense of control over one's work; deciding what or how to do your work. The only MIDAS® subscale that has a (weak) correlation is intrapersonal: personal knowledge/efficacy ($r=.22$; $p<.00$), which is the awareness of one's own ideas, and abilities, and ability to achieve personal goals.

Challenging work refers to the sense of having challenging tasks and working on important projects; so it is a positive thing. Five intelligences have a significant positive correlation with experiencing work as challenging. In particular, when someone scores higher on intrapersonal ($r=.34$; $p<.000$), interpersonal ($r=.28$; $p<.00$), linguistic ($r=.20$; $p=.01$), visual-spatial ($r=.19$; $p=.01$) or logical-mathematical ($r=.15$; $p=.04$) intelligence, one tends to experience work as somewhat more challenging. The two emotional intelligences, that rank high in job profile, have the highest correlations. There are eight subscales on which there is a correlation. The highest of these is the *intrapersonal: personal knowledge/efficacy* subscale, with a value of .49 ($p<.00$). Also within this scale, personal effectiveness (ability to relate *oneself* well to others and manage personal relationships) gains significance at $p=0.001$ and $r=.24$. All of the interpersonal subscales gain the significance level: *social persuasion* ($r=.22$, $p<.00$), *social sensitivity* ($r=.22$, $p<.00$), and *interpersonal work* ($r=.20$, $p=.01$). Within the linguistic intelligence, the rhetorical subskill (to use language effectively for interpersonal negotiation and persuasion; so also connected to the emotional intelligences) is the second-highest of the eight correlating subscales ($r=.26$; $p<.00$).

Managerial encouragement, the sense that the boss gives a good role example, sets appropriate goals, supports the workgroup, values individual contributions, and show confidence in the workgroup, does not vary with any of the main intelligences and only correlates significantly with the subscale *intrapersonal: personal knowledge/efficacy* ($r=.15;p=.04$), indicating that people who are more capable of setting and evaluating their own goals, feel somewhat more supported by their direct management. This is interesting, because it seems to imply that self-confident people feel more supported by management (which does not mean that management is actually supporting those kind of people more).

Almost the same is true for *workgroup supports*, the sense that the individual is working in a diversely skilled group in which people communicate well, are open to new ideas, constructively challenge each other's work, trust and help each other, and feel committed to the work. None of the main scales, and only one of the subscales correlates significantly, in this case however, *visual-spatial: spatial awareness* ($r=.17;p=.045$), which is about moving objects through space easily (such as driving a car); this does not have an intuitive explanation.

For *organisational encouragement*, the perception of the organisational culture that encourages creativity through the fair and constructive judgment of ideas, reward and recognition for creative work, mechanisms for developing new ideas, an active flow of ideas, and a shared vision, we see no significant relations, even though all are negative, apart from visual-spatial intelligence.

Lack of organisational impediments, which means that the culture in the organisation is perceived as not impeding creativity because of internal political problems, harsh criticism of new ideas, destructive internal competition, avoidance of risk, and overemphasis on the status quo, comes out 13 times of 34 as significant and has *negative* correlations with the logical-mathematical ($r=-.25;p<.000$), intrapersonal ($r=-.21;p=0.004$), visual-spatial ($r=-.17;p=0.020$), and kinesthetic ($r=-.16;p=0.030$) intelligences. This indicates that the higher these are, the more the persons feel impeded by the mentioned cultural aspects. The importance of this is that the visual-spatial and kinesthetic intelligences are not deemed relevant for job descriptions in mental health work. So employees who are 'visual thinkers', for instance, do feel more impeded, as well as people who are more prone 'to act bodily'. For the intrapersonal intelligence, it is interesting to note that all its subscales except *personal knowledge/efficacy* gain significance (between $r=-.21$ and $r=-.16$), though it is not feasible to connect conclusions to this, it suggests that this ability does protect against this a bit in neutralizing it. *Logical-mathematical: everyday math* (using math to solve daily problems) and *logical-mathematical: problem-solving* (able to use logical reasoning to solve everyday problems, curiosity) both reach significance ($p<.01$) with an r of respectively $-.26$ and

-.20, suggesting that these more practically inclined persons feel more hampered by the organisation's politics. The fact that *all* intelligences are negatively correlated – though not all significantly - suggests that the more intelligent someone is, the more he feels hampered by the constraints of the organisational climate.

Sufficient resources, the sense that there is access to appropriate resources, including funds, materials, facilities, and information, correlates negatively, but only weakly, with the naturalistic intelligence ($r=-.14;p=.041$), but not with any other intelligences. Quickly seeing order in phenomena and being able to categorise them is one of the features of naturalistic intelligence that has value in a work situation. Again, this intelligence is not represented very highly in the job profile. It means that employees who are more involved with the natural world feel that they have less access to resources. This result is mainly derived from the subscale science, which is related to understanding how physics work in the natural world. On a subscale level, employees higher on *intrapersonal: personal knowledge/efficacy* feel they do have access to resources somewhat more ($r=.16;p=.034$).

The sense of a *realistic workload*, that is an absence of extreme time pressures, unrealistic expectations for productivity, and distractions from creative work, shows negative weak correlations with the naturalistic ($r=-.21;p=.004$), logical-mathematical ($r=-.21;p=.005$), visual-spatial ($r=-.18;p=.015$), linguistic ($r=-.20;p=.007$), and intrapersonal ($r=-.16;p=.028$) intelligences. So the higher these are, the more the employees tend to experience the workload as unrealistic. If we consider these in light of the MHWP, three of the important scales show up here. This suggests that employees more fitted as mental-health workers experience a tougher workload. Of the 34 scales and subscales, there are 16 significant correlations, all of these negative. The subscale personal knowledge/efficacy does not correlate positively or negatively with this sense

The KEYS® has two outcome measurements, how the subjects assess their organisation as creative and productive. Of all scales- and subscales (34) of the MIDAS®, 17 correlate significantly with creativity. The top three of these are *personal knowledge* (intrapersonal) at 0.31, the *Intrapersonal* intelligence at 0.28, and the *Interpersonal* intelligence at 0.26. It is of importance to note that all of these are about the emotional intelligences. All of the correlations are positive. For productivity, there are four correlations significant at an α of 5%, and here again, we see mainly emotional intelligences, personal knowledge/efficacy at 0.23, working with people (interpersonal) at 0.16, and the intrapersonal intelligence at 0.15. The outsider here is the vocal subscale of the musical intelligence at 0.14; this last one suggests that if you are able to sing well, you tend to see the productivity of the organisation as somewhat better (or the other way around, because of the

non-causality of the research design).

High-point and low point MI-profiles and perception of the environment

The comparison of the group of individuals with one of the multiple intelligences as the highest with the rest of the group on the variables of the KEYS® are shown in table 5. The comparison of KEYS® variables between the group with one of the intelligences as the lowest with the rest is found in Table 5. KEYS® variables are scored on a 1-5 point scale. Each of these comparisons contains 80 tests, so five, respectively seven maybe just chance effects. The frequencies of high- and low-point intelligences are not distributed evenly across the intelligences for the high point profiles ($\chi^2=117.30$, $df=0$, $p<.000$), nor for low point profiles ($\chi^2=159,652$, $df=0$, $p<.000$). Of the 187 people in this sample, about 40% has a profile with an intelligence as highest, which is *not* in the top three of the job profile. It is also noteworthy that only 4 have the logical-mathematical intelligence as highest in their profile. Since the groups may be rather small, the power of these statistics is too low to draw hard conclusions.

Table 5

Means on the KEYS® variables , comparing the group with highest intelligence, versus the rest; only the significant results given; full table available on request

HIGHPOINT	KEYS®	highest	N	Rest	N	t	df	p
LOGICAL-MATHEMATICAL	creativity	2.96	4	2.58	183	3.32	3.99	.030
LINGUISTIC	challenging work	2.96	37	2.75	150	2.21	59.66	.031
INTERPERSONAL	workgroup support	3.11	65	2.95	122	2.46	139.94	.015
INTRAPERSONAL	creativity	2.29	10	2.61	177	-2.61	11.6	.023
NATURALISTIC	creativity	2.38	28	2.63	159	-2.08	34.68	.045

Note: Tested with the Welch Two Sample T test at an α of 5%.

The output variable creativity, which relates to the individual assessing the organisation as supporting creativeness, comes up statistically significant three times. Logical-mathematical high point profiles do assess the environment as more creative, but there are very few of them around. Linguistic people find the environment offering challenging work (meant positively). Interpersonal high scorers do experience the group in which they are working as more supportive.

For the intrapersonal and naturalistic high profiles, the direction is negative. Intrapersonal people experience less support for creativeness. This seems another direction than above, where the intrapersonal intelligence had a positive correlation with challenging work. Apparently when the

intrapersonal intelligence becomes dominant, and people are extremely self-aware within a profile, something changes. Naturalistic people rate the environment as less supportive for creativeness.

Table 6

Means on the KEYS® variables, comparing group with lowest intelligence versus the rest; only the significant results given; full table available on request

LOWPOINT	KEYS®	lowest	N	rest	N	t	df	p
MUSICAL	productivity	2.67	73	2.83	114	-2.42	140.72	.017
KINESTHETIC	productivity	2.93	26	2.74	161	2.17	35.12	.037
VISUAL-SPATIAL	organization encouragement	2.17	18	2.41	169	-2.34	21.07	.030
	creativity	2.23	18	2.63	169	-2.81	20.19	.011
LINGUISTIC	productivity	3.37	6	2.75	181	4.01	5.46	.009
INTRAPERSONAL	challenging work	1.50	2	2.81	185	-12.18	1.32	.026
NATURALISTIC	realistic workload pressure	2.86	35	2.64	152	2.07	49.40	.044

Note: Tested with the Welch Two Sample T test at an α of 5%.

What is different for the low-point profiles is that the other outcome measurement of the KEYS® (productivity) shows up in these results, as well as several variables that were significant above, To summarise:

- the group with musical intelligence as their lowest in the profile do experience the organisation as less productive;
- the non-kinesthetic group finds the organisation more productive;
- the same holds for the group who are least linguistically-inclined; less talk, more productive; the group of people who are not really using images to solve problems, feel less encouraged by the organisation, and assess the organisation as less supportive of creativity than all the others with another intelligence as the lowest in their profile;
- those people with the least intrapersonal intelligence (less aware of their needs, less able to set their own goals) assess their jobs as having less challenging work; and
- people with the naturalistic intelligence as the lowest seem to be inclined to think that the work pressure is realistic.

Risk for Chronic Relative Underperformance and perception of the environment

The correlations between rCRU and the KEYS® variables are given in Table 7. There were several records in which neither the number of plus- or min-scales were 0; in these cases, a mean value could not be computed, so we assigned the difference a value of 4 when all scales were plus and -3 when all scales were min. These values were just outside the range of those of the profiles from which a value could be computed.

A significant correlation for the rCRU index proposed by blinded_2 (2020) – the difference between the mean Mahalanobis-distance of plus and min scales – is for *lack of organisational impediments*. This is a weak, negative correlation ($r=-.25$). When we observe the correlations for only those scales on which the individual abilities are underused (Mean Mahab Plus), we see the same negative correlation for the *lack of organisational impediments* ($r=-.18$) and a (tending to moderate but still weak) negative correlation ($r=-.28$) for *realistic workload pressure* gains a $p < .001$.

There are some other correlations between the number of plus- or min-scales and the KEYS® variables. The number of scales comprising the distance is significantly, though weakly, related to:

- challenging work: work is found less challenging (the sense of working on challenging projects and things of interest) when the number of scales that are below the job-profile increases;
- lack of organisational impediments: when there are more scales below specs for the job, the person feels less hindered by organisational politics and so on. The higher the number of plus scales, the individual feels a bit more hindered. This would be in the expected direction;
- realistic workload pressure: higher number of min-scales has a low positive correlation with work pressure, so these individuals find that the workload is somewhat more realistic, less stressful in time management. The higher the number of plus-scales, the more the person feels that the workload is unrealistic, time-pressure higher, and hindering creative work. Again this is in the expected direction;
- creativity: the higher the number of plus-scales, the more the person experiences the organisation as creative.

Table 7
Pearson correlations between rCRU and the KEYS® variables

	Mean Mahab Min	Nr Min	Mahab Min	Mean Mahab Plus	Nr Pls	Mahab Pls	Difference
freedom	.04 (.63)	-.11 (.19)	-.06 (.45)	.02 (.81)	.111 (.19)	-.02 (.82)	-.04 (.60)
challenging work	-.11 (.19)	-.24** (.00)	-.20* (.02)	-.00 (.97)	.239** (.00)	.05 (.59)	.07 (.38)
managerial encouragement	-.02 (.86)	-.04 (.65)	-.09 (.30)	-.09 (.32)	.039 (.65)	-.13 (.14)	-.08 (.36)
workgroup supports	-.00 (.98)	-.08 (.35)	-.04 (.66)	-.03 (.72)	.079 (.35)	.030 (.74)	-.01 (.90)
organizational encouragement	.07 (.41)	.08 (.33)	.06 (.53)	-.13 (.14)	-.082 (.33)	-.16 (.07)	-.14 (.09)
lack organizational impediments	.14 (.11)	.17* (.05)	.15 (.09)	-.18* (.03)	-.17* (.05)	-.26** (.00)	-.25** (.00)
sufficient resources	.00 (.99)	-.03 (.72)	-.06 (.49)	-.00 (.99)	.031 (.72)	-.05 (.58)	-.00 (.96)
realistic workload pressure	-.04 (.69)	.17* (.04)	-.04 (.64)	-.28** (.00)	-.17* (.04)	-.34** <.001	-.16 (.06)

Creativity (outcome)	-.08 (.38)	-.22** (.01)	-.17* (.05)	-.02 (.86)	.224** (.01)	.06 (.49)	.08 (.35)
Productivity (outcome)	.05 (.59)	-.05 (.55)	.00 (.93)	.05 (.59)	.051 (.55)	.03 (.69)	-.00 (.94)

Note: N=147. Pearson *r* correlations given. Significance between ().

** . Correlation is significant at the .01 level (2-tailed).

* . Correlation is significant at the .05 level (2-tailed).

Mahab Min: : Mahalanobis distance of intelligences lower than the job profile

Nr Min : Number of intelligences lower than the job profile

Mean Mahab Min : Mahab Min divided by Nr Min.

Mahab Plus : Mahalanobis distance of intelligences higher than the job profiled

Nr Plus : Number of intelligences higher than the job profiled

Mean Mahab Plus: Mahab Plus divided by Nr Plus

Difference : Mean Mahab Plus minus Mean Mahab Min

Looking at the differences between the group of people having their high-point intelligence in one of the three needed intelligences for the job profile, compared with those with having their high-point intelligence in one of the other five, which is the second way to operationalise rCRU, the data did not yield any significant results.

Conclusions

(1) The results show evidence that different multiple intelligences relate to the perception of the support for the creative environment. The two emotional intelligences come up most often in the results. Especially the intrapersonal intelligence correlates with the highest number of the KEYS® variables, and the personal knowledge/efficacy subscale of this intelligence seems to play an important role. This result supports our expectation of a relation between MI and perception of the supportiveness of the organisation on creativity.

(2) Laser-profiles and bottleneck-profiles show a different result on the perception of the organisation. The results are mainly on the challenging variable and the output variable creativity for the laser profiles; whereas on challenging, and the output variable productivity for the bottleneck profiles.

(3) When using the profile comparison method proposed by blinded_2 (in review), there is some support that rCRU is related negatively to the evaluation of workplace variables. In particular, people high on rCRU perceive the organisation as having a culture in which politics plays a negative role. Also, they find work pressure to be higher and more unrealistic. On the other hand, they see the organisation as having a somewhat higher creativity output. The hypotheses regarding rCRU, therefore, get some mild support.

Discussion

Theoretical implications

It may be concluded that different multiple intelligences relate to different perceptions of the organisation. In our view, the importance of the correlations present is supported by the results of the differences between high-point groups, low-point groups and especially the rCRU-group differences.

The MIDAS® and the KEYS® are both instruments that ask the subjects to report how they assess an 'object', though the direction of the assessment is opposite. The MIDAS® is directed inwards, the person is reflecting upon him- or herself and the KEYS® is directed outwards, asking the person to reflect upon the organisation in which he or she is working. Even though it is realistic to assume that personality and capabilities of the person influence how he or she assesses a situation (otherwise, the whole point of this research would be moot), high correlations between intelligences and the different circumstances measured by the KEYS® would be unexpected. For instance, a correlation of about -0.8 between visual-spatial intelligence and the sense of a realistic workload would be pretty disturbing if this had not been picked up before in earlier research and translated to management practices; having people that think in images supported to experience less workload. Therefore, we think that the correlations that present themselves here may be weak but interesting enough.

There has been much criticism on the theory of multiple intelligences, especially within the IQ domain, which reveals itself in the discussion of g (general intelligence). There has been no resolution to these issues. Blinded_3 (2016) conclude that the debate takes place on two different levels of aggregation and that both approaches have different merits and understand different phenomena. The existence of g has not been questioned by multiple intelligence theory at all; it mainly asks what g explains (Gardner, 1999, p. 7). With the advance of neuropsychological research techniques, it becomes more apparent that there is evidence for the concept of multiple intelligences (Shearer, 2020; Shearer & Karanian, 2017). The present research suggests that using the concept of multiple intelligences leads to meaningful results, which can be of practical use, mainly in human resource management, as described below.

Even though it might be obvious, this research gives evidence that the intrapersonal intelligence – the very private intelligence, 'knowing thyself', having access to your feelings, to discriminate between them, label them and using them to guide one's behaviour, and having a viable and effective model of him- or herself (see Gardner, 1993, p. 17) –, is of importance in the work environment. The results suggest that a person who is good at this intelligence sees his work as more challenging, the organisation having a more creative output and being more productive, even though he feels a little more organisational impediments, and suffers somewhat more from

unrealistic work pressure. There are indications, from the subscale personal knowledge/efficacy, that he experiences more freedom, support from management and enough resources to do his work. People with this intelligence as the lowest experience less freedom of choice in doing their job and find their work non-challenging. The intrapersonal intelligence is conceptually tied to, for instance, self-efficacy and personal leadership.

Of course, we need to be prudent about the results; as for now, there is no solid base of evidence to suggest that personal intelligences, or emotional intelligences, in the workplace matter much (Zeidner et al., 2004).

Methodological limitations

Correlating the MIDAS® variables with the KEYS® variables led to 340 correlations, of which 70 are significant on at least the 5% level. This means that, at worst, some 17 of the correlations could be assigned to pure chance. Also, all correlations are relatively low (even though consistent). We think that because the intent was to explore an uncharted area in a way that indeed might look like seeing what fish would bite, these results are satisfactory. The relations found, especially those concerning the intrapersonal intelligence and its subscale personal knowledge, merit a more sophisticated design in future research. The same is true for the results on the relation of the risk for chronic relative underperformance.

We also have to be reserved about these results because of the characteristics of the subjects. Mental health care workers are not 'average'. They are highly educated and skilled in dealing with complicated feelings, concealed motives and desires, and they are knowledgeable in psychic disturbances and other complex behaviour. This might influence how they assess themselves and the environment, which might be different from other groups. So, it is unclear whether the results can be generalised to employees in other domains. For this further research is needed.

A third circumstance that we need to consider, especially when evaluating the results from the rCRU, is that in this research, we had only one job profile to compare against. We cannot say whether subjects with another job profile and their own personal MI-profiles, when assessing their organisation on the KEYS®, will give similar results. Needless to say is, that more research is necessary to answer these questions. Moreover, a more longitudinal approach, measuring at more times, is necessary as well to obtain more robust results.

The research design did not include any of the variables mentioned in the Universal Model of Giftedness (blinded_1, 2015), which moderate the pathway from the intelligences to the KEYS® variables. Especially when addressing rCRU, questions about lack of compensation, job

responsibility, problems with a supervisor, or lack of support may influence a worker's motivation, which might have less to do with his intelligence. One of the problems is that there is no easy way to assess neither the state nor the trait of chronic relative underperformance. Workers may not even be aware of it (blinded_5, 2020). Furthermore, of course, it is true that a highly gifted person finds satisfaction outside his work, in arts or music, and sometimes just works to provide the money for his 'real life'.

For this research we were mainly exploring whether there would be any relations between the intelligences, rCRU and the assesment of the work environment. We did not have some rudimentary theory to start from. Many of the results arrived at, need more subjects and a more sophisticated research design to do them justice. For instance, we would need subgroups to be large enough (around 30), to have a high enough power.

Managerial implications

One of the conclusion is that it is meaningful for organisations to have some idea about where the talents of their employees lie and that especially some aspects of the assessment of the organisational environment vary with the capabilities and skills (intelligences) of their employees. It is especially worthwhile to invest in enhancing the personal knowledge/efficacy of its employees.

What we do not propose is that the results from this research could in any way be sufficient for selection purposes. The MIDAS® is too crude an instrument for this, and as argued before, the relations are there but weak. Administering the questionnaire and then concluding that because of being higher at risk for CRU, based upon the high-point scale in one of the not necessary intelligences, the person should not be hired would be unethical and go beyond what this research meant to achieve.

What the model of multiple intelligences might be used for is to get a snapshot of (parts of) the organisation, if the employees are willing to do the assessment, and then use the results to prevent the things perceived as unfavourable, such as the possible assessment of the work pressure, or how the organisation by having a culture with impediments makes it more challenging to see the organisation as creative or productive. Enhancing the possibilities to be creative in their work is important for the well-being of the employees (Helzer & Kim, 2019). Creativeness is a habit that can be and often is suppressed (Sternberg, 2012). Organisations often ask for creative thinking people, as long as when they are hired they do not act creatively, thus disturbing standards and protocol, and the way we do things (Persson, 2017). It must be noted that obtaining a complete set of MIDAS® data for all employees may be quite difficult (as we experienced for this research as

well), as privacy and other personal concerns influence the willingness to do a questionnaire on such a thing as 'your intelligence'.

How individuals experience work pressure and how much the organisation is hindering creativeness correlates negatively with calculated rCRU. This might suggest that, since about half of the subjects are in the rCRU-group, it is helpful to know about this and devise strategies to prevent adverse effects. For instance, it may be helpful to address the workload and the 'politics' of the organisation during the yearly assessment of the employee, especially when the signals are there that they might have a CRU profile. This might help in reducing burnout, boreout, or job-hopping.

If one would like to take a snapshot of the risk for Chronic Relative Underperformance, using the described index to pinpoint persons at risk, then job profiles are needed. In this study, we used the profile from blinded_4 (2015). This profile was obtained by an adapted version of the MIDAS®, the MIDAS-JOB. There are several ways of creating these profiles, for instance, using a group of experts on the function to be assessed, and having them estimate the percentage in which each of the eight intelligences is important for the job, and then validating these. This can lead to a set of job profiles with differences that make sense within a particular setting.

One of the steps in the personal validation of a MIDAS®-profile is the 'validation interview'; one element is exploring the activities a person likes to do and reflect upon these specifically, trying to align these with possibilities in their work. When this interview was with the organisation's management team in which this research was done, it surfaced that one of the financial managers used to be a carpenter and had a keen eye for interior design. In other words, he possessed a whole range of skills that were not used in his job. What came from this was the agreement that if another building were opened, he would be consulted on the interior design. A boost of energy within the whole group of managers resulted from this. The lesson learned from this example, and corroborated by the results from this research, is that it is important to know employees beyond the skills needed. Taking the full complement of skills and abilities into account, the 'whole person', instead of only those needed for the job, and planning the employee's career together with him, might lower the risk for dropout significantly.

The results of this research suggests that talents or skills and abilities beyond those needed in the function influence how the organisation is seen by the employees and its productivity and creativity. It suggests that Taylorism is like the worm Ouroboros, biting its tail. The nature of work is changing, and it is necessary to attend to individual differences in knowledge, skills and motivation (Ackerman & Kanfer, 2020). Further research on multiple intelligences, different

profiles within and without job requirements, risk of chronic relative underperformance, and what this means for employees and the organisations they work in, or how it influences their performance, seems merited.

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Appendix A

Description of MIDAS® scales and subscales

Scale / subscales	Description
Linguistic	To think in words and to use language to express and understand complex meanings. Sensitivity to the meaning of words and the order among words, sounds, rhythms, inflections. To reflect on the use of language in everyday life.
<ul style="list-style-type: none"> Expressive sensitivity Rhetorical skill Writing 	<p>skill in the use of words for expressive and practical purposes.</p> <p>to use language effectively for interpersonal negotiation and persuasion</p> <p>to use words well in writing reports, letters, stories, verbal memory, reading / writing</p>
Interpersonal	To think about and understand another person. To have empathy and recognize distinctions among people and to appreciate their perspectives with sensitivity to their motives, moods and intentions. It involves interacting effectively with one or more people in familiar, casual or working circumstances.
<ul style="list-style-type: none"> Social persuasion Social sensitivity Interpersonal work 	<p>ability for influencing other people</p> <p>sensitivity to and understanding of other people's moods, feelings and point of view</p> <p>interest and skill for jobs involving working with people</p>
Intrapersonal	To think about and understand one's self. To be aware of one's strengths and weaknesses and to plan effectively to achieve personal goals. Reflecting on and monitoring one's thoughts and feelings and regulating them effectively. The ability to monitor one's self in interpersonal relationships and to act with personal efficacy.
<ul style="list-style-type: none"> Personal knowledge / efficacy Calculations Spatial problem solving Effectiveness 	<p>awareness of one's own ideas, abilities; able to achieve personal goals</p> <p>meta-cognition 'thinking about thinking' involving numerical operations.</p> <p>self awareness to problem solving, while moving self or objects through space.</p> <p>ability to relate oneself well to others and manage personal relationships.</p>
Logical-Mathematical	To think of cause and effect connections and to understand relationships among actions, objects or ideas. To calculate, quantify or consider propositions and perform complex mathematical or logical operations. It involves inductive and deductive reasoning skills as well as critical and creative problem-solving.
<ul style="list-style-type: none"> School Math Strategy games Everyday math Everyday problem solving 	<p>effective application of the learned (methodical) school calculations</p> <p>good at games of skill and strategy</p> <p>using math effectively in everyday life</p> <p>able to use logical reasoning to solve everyday problems, curiosity</p>
Visual-Spatial	To think in pictures and to perceive the visual world accurately. To think in three-dimensions and to transform one's perceptions and re-create aspects of one's visual experience via imagination. To work with objects effectively.
<ul style="list-style-type: none"> Spatial awareness Artistic design Working with objects 	<p>to solve problems of spatial orientation and moving objects through space such as driving a car.</p> <p>to create artistic designs, drawings, paintings or other crafts.</p> <p>to make, build, fix, or assemble things.</p>

Scale / subscales	Description
Musical	To think in sounds, rhythms, melodies and rhymes. To be sensitive to pitch, rhythm, timbre and tone. To recognize, create and reproduce music by using an instrument or voice. Active listening and a strong connection between music and emotions.
<ul style="list-style-type: none"> • Appreciation • Instrumental skill • Vocal ability • Composition 	<p>actively enjoys listening to music of some kind.</p> <p>skill and experience in playing a musical instrument.</p> <p>a good voice for singing in tune and in harmony.</p> <p>makes up songs or poetry and has tunes on his/her mind.</p>
Kinesthetic	To think in movements and to use the body in skilled and complicated ways for expressive and goal directed activities. A sense of timing, coordination for whole body movement and the use of hands for manipulating objects.
<ul style="list-style-type: none"> • Athletic • Dexterity 	<p>ability to move the whole body for physical activities such as balancing, coordination and sports</p> <p>to use the hands with dexterity and skill for detailed activities and expressive moment.</p>
Naturalistic	To understand the natural world including plants, animals and scientific studies. To recognize, name and classify individuals, species and ecological relationships. To interact effectively with living creatures and discern patterns of life & natural forces.
<ul style="list-style-type: none"> • Science • Animals • Plants 	<p>knowledge of natural living energy forces including cooking, weather and physics.</p> <p>skill for understanding animal behavior, needs, characteristics</p> <p>ability to work with plants, i.e., gardening, farming and horticulture.</p>

Adapted from Shearer (1996) and the MIDAS® Online Management System

Appendix B

Table 1

Pearson correlations between MIDAS® main- and subscales and the KEYS®

		Freedom	Challenging work	Managerial encouragement	Workgroup support	Organizational encouragement	Lack or organizational impediments	Sufficient resources	Realistic workload pressure	Creativity	Productivity	# significant
MUSICAL	r	-.05	-.05	-.03	.01	-.10	-.11	-.03	-.08	.05	.10	0
	sign.	.53	.53	.68	.90	.18	.13	.66	.27	.47	.19	
Musical appreciation	r	-.11	-.06	-.03	.03	-.12	-.15*	-.06	-.11	.05	.05	1
	sign.	.13	.39	.68	.71	.11	.04	.44	.15	.48	.53	
Instrumental skill	r	-.01	.00	-.04	.05	-.11	-.10	-.05	-.10	.06	.12	0
	sign.	.90	.96	.61	.50	.15	.18	.54	.19	.39	.11	
Vocal ability	r	-.01	-.07	-.02	-.03	-.04	-.04	.02	.01	-.03	.14*	1
	sign.	.91	.33	.82	.65	.58	.63	.81	.92	.67	.05	
Composing	r	.05	.06	-.02	-.02	-.04	-.04	-.01	-.07	.15*	-.02	1
	sign.	.47	.41	.78	.76	.60	.59	.85	.36	.04	.84	
KINESTHETIC	r	.00	.05	-.10	-.03	-.08	-.16*	.01	.01	.11	-.03	1
	sign.	1.00	.49	.19	.71	.28	.03	.91	.93	.13	.70	
Athletic	r	-.03	-.01	-.17*	-.08	-.13	-.13	-.02	.02	.01	-.11	1
	sign.	.69	.93	.02	.27	.08	.07	.84	.84	.95	.12	
Dexterity	r	.03	.09	.00	.05	-.01	-.14	.00	-.02	.18*	.08	1
	sign.	.68	.21	.97	.54	.93	.06	.99	.77	.01	.29	
LOGICAL-MATHEMATICAL	r	.04	.15*	-.03	.02	-.09	-.25**	-.02	-.21**	.16*	.07	4
	sign.	.63	.04	.65	.80	.22	.00	.79	.01	.03	.35	
School Math	r	.06	.08	-.06	.07	-.06	-.12	.01	-.07	.14	.07	0
	sign.	.44	.29	.43	.38	.44	.11	.94	.33	.06	.32	
Logic games	r	.05	.23**	.08	.11	.02	-.13	.14	-.06	.20**	.12	2
	sign.	.52	.00	.29	.14	.76	.08	.06	.40	.01	.10	
Everyday math	r	-.03	.07	-.09	-.09	-.08	-.26**	-.01	-.20**	.08	.04	2
	sign.	.74	.35	.22	.20	.27	.00	.95	.01	.25	.62	
Problem solving	r	-.03	.16*	.01	-.02	-.08	-.20**	-.09	-.19**	.17*	.03	4
	sign.	.71	.03	.92	.80	.29	.01	.21	.01	.02	.71	
VISUAL-SPATIAL	r	.03	.19*	.06	.09	.05	-.17*	-.05	-.18*	.25**	.08	4
	sign.	.72	.01	.42	.20	.54	.02	.53	.02	.00	.29	
Spacial awareness	r	.07	.14	.06	.15*	.08	-.12	-.05	-.15*	.13	.08	2
	sign.	.37	.06	.38	.05	.26	.10	.54	.04	.07	.25	
Artistic design	r	-.03	.12	.04	.02	.02	-.14	-.03	-.07	.24**	.05	1
	sign.	.71	.10	.57	.81	.82	.06	.68	.36	.00	.50	
Manipulate objects	r	.01	.18*	-.02	.08	-.02	-.18*	-.01	-.21**	.16*	.04	4
	sign.	.85	.02	.84	.26	.77	.01	.94	.00	.03	.56	
LINGUISTIC	r	.03	.20**	-.05	.03	-.09	-.09	-.04	-.20**	.16*	.00	3
	sign.	.64	.01	.53	.65	.20	.20	.55	.01	.03	.98	
Expressive sensitivity	r	-.02	.13	-.04	.00	-.10	-.09	-.08	-.19*	.13	-.04	1
	sign.	.83	.07	.55	.99	.19	.21	.27	.01	.08	.61	
Rhetorical skill	r	.09	.26**	.00	.03	-.04	-.09	-.01	-.16*	.19**	.04	3
	sign.	.21	.00	.99	.67	.59	.23	.92	.03	.01	.58	
Writing	r	-.04	.01	-.11	.06	-.13	-.03	-.03	-.13	.00	-.04	0
	sign.	.60	.85	.13	.41	.07	.68	.74	.07	.99	.62	
INTERPERSONAL	r	.01	.28**	.06	.10	.01	-.14	-.03	-.09	.26**	.10	2
	sign.	.85	.00	.43	.18	.93	.05	.71	.22	.00	.17	
Social persuasion	r	.09	.22**	.04	.03	.02	-.04	.04	-.11	.24**	.00	2
	sign.	.25	.00	.63	.70	.83	.55	.64	.13	.00	.99	
Social sensitivity	r	.02	.22**	.04	.13	-.03	-.20**	-.05	-.04	.22**	.09	3
	sign.	.76	.00	.59	.08	.65	.01	.46	.57	.00	.21	
Interpersonal work	r	.01	.20**	.07	.06	.00	-.09	-.06	-.12	.15*	.16*	3
	sign.	.94	.01	.32	.45	.96	.24	.38	.11	.04	.03	
INTRAPERSONAL	r	.14	.34**	.03	.08	.01	-.21**	.04	-.16*	.28**	.15*	5
	sign.	.06	.00	.69	.25	.94	.00	.60	.03	.00	.04	
Personal knowledge	r	.22**	.49**	.15*	.03	.12	-.07	.16*	.00	.31**	.22**	6
	sign.	.00	.00	.04	.68	.09	.32	.03	.98	.00	.00	
Calculations	r	-.02	.05	-.07	.00	-.07	-.17*	-.01	-.14	.11	.06	1
	sign.	.84	.50	.33	.96	.33	.02	.89	.06	.13	.42	
Spatial problem solving	r	.11	.14	-.01	.12	-.02	-.16*	-.09	-.20**	.14	.04	2
	sign.	.12	.06	.85	.12	.80	.02	.23	.01	.05	.57	
Effectiveness	r	.07	.24**	-.03	.07	-.09	-.16*	-.03	-.15*	.19**	.04	4
	sign.	.35	.00	.67	.34	.22	.02	.64	.04	.01	.56	
NATURALISTIC	r	.02	.04	.02	.02	-.03	-.09	-.15*	-.21**	.07	-.10	2
	sign.	.81	.61	.83	.80	.70	.22	.04	.00	.38	.17	
Science	r	.11	.05	-.03	.03	-.10	-.13	-.17	-.21**	.05	-.09	2
	sign.	.12	.50	.69	.64	.19	.08	.02	.00	.50	.23	
Animals	r	-.12	-.05	-.03	-.07	-.04	-.09	-.11	-.17*	-.03	-.13	1
	sign.	.12	.48	.67	.35	.60	.20	.15	.02	.67	.07	
Plants	r	.03	.08	.08	.06	.05	-.03	-.13	-.16*	.13	-.04	1
	sign.	.70	.29	.27	.43	.49	.64	.09	.02	.08	.59	
# significant		1	14	2	1	0	13	2	16	17	4	70

Note: N=189.

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

