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Link of socio emotional context on performance in categorization task on adults moderate to severe intellectual disabilities

Igier, S. Pennequin, V.

Abstract

Purpose: Studies on intellectual disabilities describe difficulties at the cognitive level but little about the other factors that can impact the individual's performance. The aim of this research was thus to assess the effects of the socio-emotional context on the performance of adults with intellectual disabilities in a cognitive task. Our main hypothesis was that people with intellectual disabilities will not have the cognitive ability to see the socioemotional environment as a potential resource and that they could not use it to mobilize their cognitive resources to try and improve their performance and adopt more positive behavior.

Design and methodology: 32 people with moderate to severe intellectual disabilities were recruited. They performed a categorization task and were then given their results. Throughout the test, the psychologist observed the participants' behavior, and more specifically their emotional expressions, their pro-social behavior, and their respect for social rules.

Findings: The results support our hypotheses, with better performance among participants who adopted pro-social behaviors, respected the rules and displayed positive emotional expressions. These results highlight the central role played by others in the ability of adults with intellectual disabilities to adapt to a given situation.

Limitations: This study was conducted by a psychologist, which could have biased the relationship with the participants. A complementary study is in progress to measure the effects.

Practical implications: These findings have implications for cognitive remediation tasks aimed at mobilizing the cognitive resources of adults with intellectual disabilities.

Originality: To our knowledge, this is the only study to evaluate the role of the socio-emotional environment on the performance of adults with intellectual disabilities.

Key words: intellectual disability, emotion, social environment, cognition, moderate and severe impairment, social rules, performance.

Introduction

The interactions between cognition and the physical, emotional, and social environment have been investigated through approaches such as embodied cognition and social cognition (Vallacher & Nowak, 2017; Vlasceanu et al., 2018). For example, the theory of “*situated*” cognition postulates that cognition is inseparable from actions (Suchman, 1987, developed by Theureau, 2004). Thus, any acquisition of knowledge takes place in an activity that is linked to the social, cultural, and physical context (Laville, 2000). The action is considered social because the individual understands it according to the modalities constructed during previous interactions (Theureau, 2004). It is influenced by many aspects inherent to the situation in which it occurs, such as the cognitive resources (e.g. computer, calculator, paper/pencil) and social resources (e.g. a key person) the individual can lean on. In this way, performance relies not only on the cognitive capacities of the person but also on the cognitive system formed with the surrounding environment. According to Laville (2000), environmental resources systematically complement the individual’s cognitive capacities.

According to “*social baseline theory*” (Gross, Medina-DeVilliers, 2020), early experiences and individual traits alter a person's expectations of the reliability and usefulness of social resources in the environment, constituting a unique social reference. The same environment will thus produce differential effects on the cognition, physiology and behavior of individuals

according to their own "*social baseline*". With each new situation, they update their experience; "*each event with which we are confronted leaves an emotional trace in our nervous system, but also a trace of learning which allows us to be more efficient during the process*" (Canini & Trousselard p 3, 2016). Actions, thoughts, emotions about oneself and others, as well as interpersonal relationships, can be considered to some extent as social resources and are cognitively taken into account by individuals in their actions (Huguet et al., 2002). The social baseline can therefore evolve over the lifespan. The effect of the presence of others on cognitive performance can be either deleterious or, by contrast, can provide support and improve performance. The social relationship (through cognitive control) can reduce certain emotional factors (stress, anxiety) and enable cognitive reassessment (Ochsner & Gross, 2005). However, conversely, if others do not provide this support, emotional disorders can increase and be more costly in terms of cognitive resources. The socio-emotional context has a major but transitory influence on cognitive processing (Gross & Medina-DeVilliers, 2020). Finally, according to Vlasceanu et al. (2018), dyadic exchange involves a combination of shared attention, social exchange and emotional contagion. This interaction induces a search for belonging to a group, a perception of similarity/difference, and a relational motivation. These socio-emotional mechanisms can be costly in terms of cognitive load, but at the same time are essential in many ways; they contribute to individuals' emotional stability (Alduncin, 2014), their relationships with others, and also their performance and individual success (Amdurer, 2014).

This socio-emotional approach to cognition seems particularly relevant in the domain of intellectual disability. Indeed, the definition of intellectual disability no longer relates only to the results of psychotechnical tests but also to the individual's ability to adapt to his or her environment (World Health Organization, 2018). Thus, cognitive difficulties lead to major disorders in communication, emotional regulation and social interactions (Beirne-Smith,

Patton & Shannon, 2006; Sukhodolsky & Butter, 2007). Several studies have highlighted these difficulties, particularly for people with moderate to severe cognitive impairment (Njardvik, 1999). However, while these interaction difficulties are present from childhood and continue into adulthood, interest in relationships with others seems to increase with age. Moreover, adults with intellectual disabilities show deficits in emotional expression, linked in part to a number of psychiatric pathologies, and which can affect their interpersonal relationships (Deb et al., 2001). Difficulty accessing efficient emotion regulation strategies can lead to behavioral disorders (McClintock et al., 2003; Murphy et al., 2005). Finally, understanding social rules is difficult for these people, linked to difficulties in their socio-emotional behavior (Hippolyte et al., 2010; Matson et al., 2009). A number of hypotheses have been put forward to explain their poor social skills, including disorders of emotional expression, lack of comprehension of the body language of the other, fragile self-esteem, and partial understanding of what is said by others (Gendron & Chabot, 2008; Logsdon, 2009). Thus, these individuals have difficulty expressing their feelings in a way that can be easily understood by others. They also have difficulty initiating interactions. Another explanation for unsuitable social behavior is linked to cognitive disorders, and more specifically to executive and attentional functions (Cebula, 2010). On the other hand, some studies have shown that people with intellectual disabilities may exhibit behavior that is appropriate but that is based more on social desirability than on cognitive performance (Fortin & Carrier, 1994). Language disorders also constitute a barrier to appropriate social behavior (Matson, 2009; Soresi & Nota, 2000). These data on the socio-emotional disorders of people with intellectual disabilities show the relevance of "situated" cognition in order to better understand their difficulties and thus optimize their cognitive performance by creating a suitable environment.

Studies with this population also reveal significant disparities between individuals and pathologies. For example, people with autism spectrum disorders have specific difficulty coping with the socio-emotional context (Njardvik, 1999). Other people, especially those with Down's syndrome, tend to exhibit inappropriate social behavior, such as "*hyper-sociability*". They thus expend a lot of energy in social relationships, possibly to the detriment of their cognitive performance. It has also been observed that people with intellectual disabilities have a deficit in theory of mind, namely the ability to understand and adjust to other people's mental states (Sigman et al., 1999). Thus, people with intellectual disabilities who do not perceive the emotions of others may not act appropriately in the socio-emotional situation (Zelazo, 1996). These differences based on the etiology and pathologies associated with intellectual disabilities could also lead to differences in the social baseline of these people.

Most research on intellectual disability focuses on the individuals' cognitive deficits in general, and few studies have investigated the role of the context on the performance of adults. Due to their cognitive difficulties, it seems important to study to what extent environmental resources can improve their performance. The purpose of the present study is thus to examine how the cognitive performance of adults with moderate to severe intellectual disabilities interacts with the environment in which the task is performed and evaluate any inefficiency affecting their performance. The findings should provide a base for remediation approaches adjusted to the individual's needs.

Aims and hypotheses

The aim of this research was to study how people with intellectual disabilities respond to the socio-emotional context when performing a cognitive task. Our main hypothesis is that people with intellectual disabilities could benefit from the socio-emotional environment and adjust to it, enabling them to mobilize their cognitive resources and thus improve their performance.

More specifically, we expected that significant efforts to engage in pro-social behavior, to act in accordance with social rules, and positive emotional expression would be linked to better performance in a categorization task.

Method

Design

It is a correlational study seeking to explain a dependent variable by several independent variables

Participants

Participants were 32 adults in establishments for people with moderate to severe intellectual disabilities in France (average developmental age 4.64 years, standard deviation 1.21, as assessed on Raven Matrices). Participants included 16 women and 16 men with a chronological age of 23 to 70 years (mean 42.8, standard deviation 14.3). Most of the participants were permanently institutionalized in long term. Others were in daycare and lived at home alone with assistance or with their family and some had part-time work. Most of the participants had associated psycho-behavioral disorders, and conduct disorders characterized by "challenging behaviors". Some also had associated psychiatric disorders such as psychosis, depression, anxiety or an autism spectrum disorder. The profiles of the participants are thus heterogeneous but reflect the reality of institutional life. All the participants had relatively efficient communication skills (oral language and/or an alternative method of communication).

Measures

The participants' developmental age was assessed using the Raven's Colored Progressive Matrices (PM 47, Raven 1936), which evaluates analogical reasoning but is also correlated with overall intelligence (Prabhakaran et al., 1997).

Cognitive performance assessment tool

The cognitive task consisted of items from the Picture Concepts subscale of the WISC 4 (Wechsler Intelligence Scale for Children, Wechsler 2005). Participants completed 9 trials with two randomly selected levels of difficulty (match 2 pictures out of 4 or 6) in order to limit ceiling and floor effects. Responses were scored according to the developmental level of the type of categorization task: one point for perceptual classification (associating two items of the same color, e.g. a yellow flower and a chick), two points for thematic classification (associating two items that belong to the same daily activity, e.g. washing-up liquid and an item of clothing), three points for a taxonomic classification (associating two items belonging to the same semantic category, e.g. a banana and an apple). Categorization errors (choice of two unrelated items) were rated 0, and the maximum possible score was 27. This test was chosen because the pictures have been used in previous studies and all have the same format. The test has good test-retest reliability.

Assessment of the effect of the socio-emotional context

Participants' emotional expressions and pro-social behavior with regard to social rules were assessed using Baurain and Nader-Grosbois's (2011) emotion regulation analysis grid, based on the model of Yeates et al. (2007). This tool identifies the participant's social and emotional skills while performing a task. The original version has three forms; for the purposes of the present study, we used the one for child-adult dyads, which corresponds to the interaction between the psychologist and the participant while performing the task. Although the

participants were adults, their relationship with the experimenter is asymmetrical and more comparable to a child/adult relationship, particularly in relation to the type of behavior observed (attention-seeking, apprehension, respect, etc.), as explained by De Paolis and Mugny (1991) and Monteil (1989).

Analyses

We carried out descriptive and correlation analyses using Statistica version 10 software. The dependent variable was the participant's score on the categorization task. The independent variables were the scores for each emotional expression, respect of social rules and pro-social behavior. We performed correlation analyses to verify our hypothesis that significant pro-social behavior, complying with social rules, and positive emotional expression would be linked to better performance on the categorization task.

Three step-by-step linear regression analyses were performed in which the order of each predictor depended on its correlation with the dependent variable. These analyses aimed to explain the role of emotional expression, social rules and pro-social behavior on categorization performance.

Procedure

The study was conducted by a psychologist, who had known the participants since 2016.

Assessments were carried out in the psychologist's office in the participants' residential institution or day-care facility.

Immediately after completing the cognitive task, participants were given their results. The psychologist rated their emotional expression and behavior before, during and after the task on the observation grid (Baurain & Nader-Grosbois, 2011). For emotional expression, the

psychologist rated the frequency of each emotion (joy, sadness, frustration, anger, fear, and anxiety) on a 4-point Likert-type scale (Likert 1932) (0 non-existent, 1 infrequent, 2 moderately frequent, 3 very frequent), before, during and after the task.

For pro-social behavior, items were also rated on a Likert-type scale. They included self-affirmation, perseverance, socio-extravert behavior, empathy, control of difficulty and attentive behavior. The maximum score was 18. The same procedure was used for behavior in relation to social rules: following instructions, listening behavior and patience. The maximum number of points was 12, with higher scores indicating more appropriate social behavior.

This procedure is straightforward, as it only involves putting a number in the corresponding box, and it is carried out in real-time in order to limit post-test interpretation bias. The test duration was short (30 minutes maximum) to limit any bias related to fatigue. Ethical considerations

All the participants and their legal representatives gave their consent; the legal representatives signed a form that gave precise information about the task, while the participants were given a simplified form using smileys. If the participants showed excessive mood or behavior disturbances during the task or if they indicated that they did not want to continue, the experiment stopped immediately.

Findings

First, the participants' performance on the categorization task was analyzed. There was a very high error rate (35.76%), with no floor effect. Mean score was 14.93 with a standard deviation

of 4.76. There was no significant correlation between developmental age, gender and chronological age. Most scores on the pro-social behavior items and those relating to social rules correlated with categorization performance, with positive correlations between categorization performance and following instructions, listening behavior, patience, self-assertion, perseverance, control of difficulty, and attention. Only extraversion and empathy did not appear to be significantly correlated with performance. No significant correlation appeared between performance and emotional expression. The matrix of correlation between categorization scores and the emotional expression items before, during and after performing the task is summarized in the Table I.

Insert table I.

Overall, emotional expression remained relatively stable throughout the task, with similar scores of the same emotion before, during and after the task.

In the first step-by-step linear regression analysis, the dependent variable was task performance and the predictors were the emotional expressions observed before, during and after the task (see Table II).

Insert table II

Thus, lower levels of frustration during the task and higher levels of joy and fear after the task were related to better performance.

In the second linear regression analysis (Table III), the dependent variable remained categorization performance and the predictors were the items concerning respect of social rules.

Insert table III

Participants who listened better to the psychologist's instructions scored higher on the categorization task.

In the third linear regression (Table IV), the predictors were the pro-social behavior scores, and the dependent variable was categorization performance.

Insert table IV

Self-assertion explained 42.93% of the variance in performance scores, with better performance by participants who could express their ideas appropriately.

Discussion

The main results show that the more participants adopted pro-social behaviors, respected the rules and manifested positive emotional expressions during the task, the better their performance.

More specifically, the results show that the participants' performance on the categorization task was poor, in line with the literature (Bruderlein 1998), but we observed high levels of context-appropriate pro-social behavior and respect for social rules, in contrast to the findings of previous research (Matson, 2009; Hippolyte et al., 2010). Most of the behaviors observed were positively correlated with categorization performance, in particular self-affirmation and listening behavior, but also perseverance, patience, following instructions, controlling difficulty and attention to the task. Emotional expression was stable before, during and after the task. Better performance was also associated with the expression of joy. In this study, post-task fear (which may be related to the notion of self-esteem) appeared to be an important predictor of performance. It is clearly not desirable to reproduce this emotion to improve performance, but it does provide an indication of its impact.

These results corroborate Gross and Medina-DeVilliers' model (Gross & Medina-DeVilliers, 2020) and show that the social baseline of adults with intellectual disabilities is formed by positive expectations of the social resources available to them. As observed by Laville (2000), the resources of the environment systematically supplement the cognitive capacities of the individual, whose performance is based not only on his or her cognitive capacities, but also on the cognitive system formed with the environment. More precisely, the environmental resources (cognitive and social) that are available to people with intellectual disabilities should be viewed as cognitive aids. Emotional disorders have been widely reported to play a role in the understanding and emotional regulation of adults with intellectual disabilities (Beirne-Smith, Patton et al., 2006; Sukhodolsky & Butter, 2007). The results of the present study show a relative preservation of emotional expression, which is in line with the results of Lemétayer and Gueffier (2006) among adolescents with intellectual disabilities. Emotional skills are not all affected similarly in people with intellectual disabilities, supporting the view that this developmental disorder is not a homogeneous deficit, and that certain skills can be used to optimize their behavior. Our results also suggest that these individuals have the potential to improve their social skills throughout their life. However, the purpose of developing these skills needs to be questioned. Indeed, while they can improve performance and limit cognitive load for the *neurotypical* population (Brackett & Salovey, 2006), and to some extent for people with intellectual disabilities, among the latter, these skills remain poor. So why should they make the effort to respect social rules and develop pro-social behaviour, which is known to be costly for them? In this context, it is possible that social desirability (Fortin & Carrier, 1994; Tuffrey-Wijne & McEnhill, 2008) may take precedence over cognitive efficiency. In fact, people with intellectual disabilities are often rejected at the social and relational level, and "... they will therefore seek to avoid these experiences by trying to

correspond as much as possible to the expectations of their interlocutors in order to experience approval and valuation” (Guillemette & Boisvert, 2003, p 5).

Moreover, the expression of joy observed throughout the intervention, in spite of task difficulty, suggests the importance of the secure and containing environment provided by the psychologist (Alduncin, 2014). It is therefore possible that the pre-existing relationship of trust (the psychologist had known the participants for several years) played a role in the way the participants responded to the situation, and in their positive emotional expressions despite their poor performance. This could explain why they did not show overly negative emotional expression (e.g. fear, anger), even after the psychologist's feedback on their performance in the categorization task. Thus, a secure, supporting relationship with a known person (here the psychologist) could allow participants to perform a task more efficiently, even when they are in a potentially anxiety-provoking test situation (Canini & Trousselard, 2016). However, this research is based on a relatively small sample and should be replicated with more objective data, particularly concerning the participants' perception of their experience of the situation.

Conclusion

To our knowledge, no studies have evaluated the effects of the socio-emotional context on the cognitive performance of adults with moderate to severe intellectual disabilities, and the aim of this study was to fill this gap. The results indicate that the participants were able to use the context to mobilize their cognitive capacities. It is possible that their special relationship with the psychologist could explain in part their pro-social behaviors. This suggests that the other person plays a central and determining role in the participants' ability to attend and adapt to a given situation. This effect should be taken into account, particularly during cognitive remediation workshops, in order to stimulate the cognitive skills of adults with intellectual disabilities. It would be interesting to extend this work by studying more precisely the social baseline of people with intellectual disabilities, in particular with regard to the effect of the

familiarity of the resource person, which raises the question of whether the socio-emotional context is as beneficial if they do not have the same trusting relationship with the person who sets up the situation.

This study has a number of limitations. For greater objectivity, the evaluations could be filmed or an observer could note the participant's behavior during the task. Finally, the task was administered by a psychologist, whose relationship with the participants may have biased the findings. A further study (in progress) will examine whether the effect of familiarity (e.g. known professional) has a role on participants' metacognition, performance, level of well-being and investment in the task.

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Table I: Matrix of correlations between emotional expressions before, during and after the categorization task

	Means	standart deviation	before joy	before sadness	before frustration	before anger	before fear	before anxiety	during joy	during sadness	pendant frustration/deception	during anger	during anxiety	during fear	after joy	after anger	after sadness	after fear
before joy	2.16	0.99	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
before sadness	0.06	0.25	-0.17	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
before frustration	0.16	0.51	0.08	-0.08	1.00	-	-	-	-	-	-	-	-	-	-	-	-	-
before anger	0.03	0.18	-0.03	-0.05	0.30	1.00	-	-	-	-	-	-	-	-	-	-	-	-
before fear	0.38	0.79	-0.41	0.54	0.17	-0.09	1.00	-	-	-	-	-	-	-	-	-	-	-
before anxiety	1.00	0.84	-0.35	0.16	0.07	-0.22	0.48	1.00	-	-	-	-	-	-	-	-	-	-
during joy	1.88	0.98	0.62	-0.24	-0.02	-0.16	-0.60	-0.47	1.00	-	-	-	-	-	-	-	-	-
during sadness	0.06	0.35	0.16	-0.05	-0.06	-0.03	0.14	0.00	-0.16	1.00	-	-	-	-	-	-	-	-
pendant frustration/deception	0.66	0.79	-0.09	-0.05	0.30	0.08	0.16	0.10	-0.23	0.31	1.00	-	-	-	-	-	-	-
during anger	0.13	0.42	0.11	-0.08	0.20	0.81	-0.05	-0.27	-0.20	0.38	0.33	1.00	-	-	-	-	-	-
during anxiety	1.00	0.92	-0.32	0.14	0.07	-0.20	0.53	0.63	-0.61	0.40	0.31	0.00	1.00	-	-	-	-	-
during fear	0.41	0.76	-0.48	0.21	0.33	-0.10	0.65	0.51	-0.54	0.38	0.19	0.04	0.61	1.00	-	-	-	-
after joy	2.13	0.79	0.59	-0.37	0.11	-0.03	-0.49	-0.29	0.73	-0.03	-0.08	0.05	-0.31	-0.36	1.00	-	-	-
after anger	0.03	0.18	-0.03	-0.05	0.30	1.00	-0.09	-0.22	-0.16	-0.03	0.08	0.81	-0.20	-0.10	-0.03	1.00	-	-
after sadness	0.13	0.42	0.18	-0.08	-0.09	-0.05	-0.14	-0.18	0.27	-0.05	-0.26	-0.09	-0.25	-0.16	-0.05	-0.05	1.00	-
after fear	0.09	0.39	-0.04	0.27	-0.08	-0.04	0.20	0.10	-0.31	-0.04	0.11	-0.07	0.09	0.09	-0.46	-0.04	-0.07	1.00

Table II. Step-by-step ascending regression analysis with the scores obtained in categorization as the dependent variable and the scores obtained by emotion are the predictors.

Steps	predictors	β	R ²	F
1	after task joy	.32	.1011	3.37
2	after task joy	.56*	.3301	7.15
	after task fear	.54*		
3	after task joy	.55*	.3887	5.93
	after task fear	.56*		
	during task frustration	-0,24		
4	after task joy	.84*	.4547	5.63
	after task fear	.58*		
	during task frustration	-0,31*		
	during task joy	-0,39		

* p < .05

Table III. Step by step ascending regression analysis with the scores obtained in categorization as the dependent variable and the scores obtained in relation to social rules are the predictors

steps	predictors	β	R ²	F
1	listening	.67*	.4460	24.16

* p < .05

Table IV. Step-by-step ascending regression analysis with the scores obtained in categorization as the dependent variable and the scores obtained in relation to pro-social engagement are the predictors.

steps	predictors	β	R ²	F
1	Auto-affirmation	.66*	.4293	22.56

* p < .05