Autism: New Conceptual Propositional Hypothesis

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Abstract:
The initial sensory-attention perceptual processing in people with autism spectrum disorder forms a global analysis, but semantic content is limited, therefore, they need to complete their semantic understanding, through second analysis with purpose to encode a greater number of local details, units and/or conceptual categories. This cognitive action developed through relational connections with concepts previously stored in permanent memory (semantic memory). Study has been designed a qualitative-quantitative triangulated way. The qualitative analysis is based on a textual-conceptual perceptual and visual-perceptual study, while the quantitative analysis has been achieved through non-parametric statistical comparative tests regarding to the grouped variable: “participants”. A total of 10 participants have collaborated in this study, 5 neurotypical participants and 5 participants with autism spectrum disorder, aged between 16-17 years old. The comparative analysis allows delimit partial differential aspects throughout study variables, according to participants’ group variable and, hence, the development of a new cognitive-perceptive theory of specific propositional processing to people with autism: Global Cyclic Theory has been concluded.

Keywords: Autism spectrum disorder, Attention-cognition-perception, Semantic memory, Conceptual propositional theory.

Introduction

Autism spectrum disorder [ASD] is a highly heterogeneous specific feature of neurodevelopment, whose general characteristics are defined by two basic dimensions, related to communication and social interaction needs and restrictive and stereotyped behaviors with three levels of needs (American Psychiatric Association [APA], 2013) and, also World Health Organization [WHO], 1993).

From the perspective of first propositional theories regarding perceptual thought in people with ASD, that have been contributed by central cognitive coherence theory, proposed by Frith (1989; 2004) and Happé (1999), the bias towards weakness in the cognitive-perceptual coherence of people with ASD has been assumed, regarding to information processing along the contextual action, both to conceptual and visuospatial level.

Thus, people with ASD present specific difficulties and particularities in integrating information they must give a contextualized semantic attribution, while, contrary, they show a tendency to localize details and specific aspects of perceptive processual stimulus, that has been corroborated by the experimental researches of Shah & Frith (1993) and, likewise, Caron, Mottron, Berthiaume & Dawson (2006).

These studies were expanded and corroborated by Happé & Frith (2006). Authors show the presence of specific skills and worries in people...
with ASD for the parts and isolated elements of information, which configures an unusual processing of perceptual process at individuals with autism, characterized by weak processing regarding its normotypical peers, while neurotypical person have shown a propensity to strong perceptive nature or tendency towards the highest initial semantic global perception of the contextual information.

This aptness, explained by specific perceptual processing, it is neither easily explained by other cognitive factors (Rajendran & Mitchell, 2007), which, according these authors, it’ll be configure the basic difference in the attentional-perceptual component between both group of participants. Jolliffe and Baron-Cohen (2001) describe that person with autism present more needs in semantically integrating information from a conceptual perspective if it is compared with visuospatial information, where the initial perceptive processing is semantically higher. This characteristic cognitive-perceptive information processing, according Rinehart, Bradshaw, Moss, Brereton, & Tonge (2000) and, also, Sheppard, Ropar, & Mitchell (2009), it will continue into adulthood.

The empirical whole of these studies shows the presence of a perceptual need in participants with ASD to semantically integrate the environmental information, while the local stimulus analysis found higher performance, comparing normotypical people, which it has given the configuration of the theory of improved functioning of Mottron y Burack (2001). This hypothesis shapes a perceptual sensory conception characterized by local and visual-constructive psychological processing of information with low levels of semantic processing, especially, if the information proceeds from the textual-conceptual area. In this sense, research based on tone discrimination tasks and mechanical memory activities, suggested that person with ASD found higher levels in boys, girls and adolescents with ASD regarding to their normotypical peers (Heaton, Pring, & Hermelin, 1999), although, in posterior research studies, it has been found these findings only corresponded to subgroup corresponding diagnostic of level-1 ASD.

Heaton, Williams, Cummins & Happé (2008) also showed that fragmented perception skills presented an improvement into perceptual processing if visuospatial tasks were used, instead of verbal-conceptual activities, and no significant differences were observed both in participants with ASD of level 1, 2 and 3. Even Plaisted & Davis (2009) and Allen & Chambers (2011) shape that perception theory, since when it comes to visual forms or drawings with meaning, students with ASD can process the stimulus as a whole global, without needing to focus on the particular and can even unite two visual forms with meaning if a process of learning the meaning of the visual contents has previously been performed.

The etiological evidence of partial and local processing way is a tendency towards hypersensory and sensitivity on people with ASD (Watling, Deitz & White, 2001), which implies the disposition towards the stimulus’ sensory analysis owing to concretion on specific relevant sensory relevant of stimulus attributed. Likewise, according Frith (1989, ob. cit.) it occurs with attentional sensitivity directed towards stimuli that may be irrelevant in the context, such as sounds or noises of environment, e.g., class change bell and handle attention to person’s clothing or object without looking attention to the person wearing it, being, for Wainwright & Bryson (1996) and, also Kern et al. (2006), a highly specific pattern of a sensory way, which constitutes the first perceptual pathway and, therefore, can influence the perception of whole input stimulus.

Although, simultaneously to these experimental studies, others indicated that neuro-perceptual specificity has not been exclusive to the ASD diagnostic group, but rather these same characteristics co-occurred in the executive processing of other neurological disorders, such as, among others, Tourette’s disorder, attention deficit with hyperactivity and obsessive-compulsive disorder (Pennington y Ozonoff, 1996; Russell, 1997).

However, all authors agree in concluding that deficits in attentional selectivity and directionality are explicative many of the
symptomatic groups found in people with ASD (Plaisted, Swettenham, & Rees, 1999), therefore, the initial attention deficit the selective attention, which upsets the perceptive global semantic processing and they suggest that processing style is defined as a deficit in the inhibition process, which delves into the most local- partial and limited perspective activity. For this reason, agreeable Rinehart, Bradshaw, Moss, Brereton & Tonge (2001) verify people with ASD have limited global semantic initial perceptual processing.

However, other studies revised these initial hypotheses (Mottron, Dawson & Soulières, 2006) and they affirm that have found an improvement in semantic perception if there’re relational- nodes throughout mediated support regarding categorical- concepts observed related on semantic previously contents learned.

Method

Goals

The main aims of this research deepened to the comparative analysis between normotypical participants and participants with ASD level 1, regarding: 1) analyze the differences on perceptive information analysis processing, through two analysis phases to conceptual and visual level, and 2) develop a new information processing propositional theory of specific perceptual- cognitive on individuals with ASD-1.

Research design

This study has been made of a qualitative-quantitative triangulated design.

The qualitative method is represented by the systematic structured interviews carried out to all study participants. The interviews are asked about the synthesis of textual-conceptual and a visuospatial information, which has been coded to normotypical participants (E_n) and to participants with ASD-1(Easd).

The quantitative analysis correlates to comparative analysis of the study variables, that were valued through non-parametric statistical tests to test for k independent samples to variables “analysis1”, “analysis2” and “deduction1” and “deduction2” variables, to conceptual (C) and visual (F) analysis, relating to "participant" variable.

Participants

A total of 10 participants have collaborated in this study, 5 normotypical participants and 5 participants with ASD level- 1 diagnosis.

All participants belong to age group between 16 and 17 years old.

Variables

The study is formed by following variables: 1) the variable group of participants: “participant”, with two values: participants with ASD level-1 (ASD-1), and neurotypical participants (normotypical), 2) the variables “Canalysis1” and “Canalysis2”, which corresponding to first and second comprehensive analysis phases, regarding to textual-conceptual- categorial analysis, throughout a history text, 3) the variables “Fanalysis1” and “Fanalysis2”, corresponding at two analysis phases of visual analysis, encoded through a figurative element, and 3) along longitudinal development of qualitative test, it was increased the variable “Cdeduction”, for conceptual analysis, and “Fdeduction” for the visual analysis, owing the differential responses found.

“Cdeduction” and “Fdeduction” variables, was relating to ability to make deductions- inductions not demanded about test development, however, spontaneously, participants linked up to conceptual and visuospatial stimulus with own imaginative processes, which’s related to ability to construct nodal- links between the information analyzed.

Procedure

Ten participants were given two tests of perceptual-conceptual analysis: 1) a synthesis of story test: “The Cretins”, and 2) description of a visual image related with different toys.

In relation to both stimuli, the following questions were asked: What is the general
Data have been structured into two analysis categories: 1) a qualitative analysis, which includes a conceptual- textual and a visuospatial analysis, and 2) a non-parametric statistical quantitative study.

**Qualitative study**

**Conceptual qualitative analysis**

From conceptual- textual perspective, a synthesis of story text “The Cretins” has been analyzed:

*The cretins’ story:*

“(... ) The great upside-down monkey circus”

– Now, let’s go to the monkeys.

– The four monkeys in the garden cage formed a family. They were Chimpa, his wife and his two little children...

– Well, in the past time, the two had worked in a circus training four monkeys. They used to teach monkeys to do cartwheels and to wear human clothes, to smoke a pipe and such nonsense...

– This meant that monkeys had to do everything upside-down. They had to dance upside down (leaning on their hands and with their feet in the air). They had to play football upside down. They had equilibrium on each other, head-down, with Chimpa below and the smallest on top, forming a tower. They even had to eat and drink upside-down...

– But, thanks to Fatty Bird, one day, the monkeys got to get away to their natural habitat. (... )”

**Source:** From the story “The Cretins”. ([https://www.loqueleo.com/ar/libro/los-cretinos](https://www.loqueleo.com/ar/libro/los-cretinos))

After reading this story, the following question was asked to this study participants: –What is the general summary you make of the story? –What do you highlight in relation to the story? When participants indicated the first story synthesis, the observer asked the question again: Tell me something else about?

Down are just some examples of the responses issued.

A normotypical participant indicated the following general answers about the synthesis of this story:

“**First analysis:** It consists of the lives of four monkeys mistreated by a pair of cretins, who, I believe they mistreated to monkeys, owing to their high avarice...” (En).

“**Second analysis:** The greedy cretins wanted to be famous with a show in the circus, in which the poor monkeys should do everything upside-down: walk, eat, drink, but, at last, they were freed by the Fatty Bird...” (En).

As can be seen, the semantic analysis attributes few local details even in the second analysis, since, intrinsically, the first analysis already includes a global- semantic information, therefore, he doesn’t think necessary to communicate about. However, if he’s asked about the local aspects, he answers rightly.

In this issue, a participant with ASD asks the analysis following:

“**First analysis:** Some cretinous gentlemen, who have four caged monkeys, to kick in them to put one show in the circus, in which the monkeys must do everything upside-down, run, walk, even drink...” (Easd).

“**Second analysis:** It was about a pair, called Cretins’ family, who had four monkeys at their care, the father, mother monkey and their two little children. The cretin gentlemen made them do everything upside-down, walk, run, eat and, even, drink. If monkeys didn’t do it, Cretins didn’t even feed them, to force them to do all these things. The smallest monkey even got light-headed to doing so things upside-down. But hence they were freed by a Fatty Bird...” (Easd).

As can be seen, in general terms, the participant with ASD indicated a greater number of local-
partial aspects, both the first analysis and, above all, along second analysis than the normotypical participant. However, the participant with ASD already includes some global content in the first analysis, although it is quite weak, therefore, subsequently, he tries to swell semantically with a greater aspect localization down the second analysis.

These connotations indicate that first unit of analysis, the intrinsic global semantic content of the normotypical person is higher-level to participant with ASD, whose perceptual process is also partial-global, but semantically was most limited, owing, above all, to deficits in neuronal relationalships inter-concepts.

It is also significant that, while the student with ASD limits himself to text content description, the normotypical participant t also elaborates deductive aspects not already requested in the initial issues, which corresponds to “Ceduction” variable: “that, I believe they were mistreated, owing to their greedy...” (OP

**Qualitative visuospatial analysis**

If instead of conceptual text, it keeps with visuospatial figure, a different process has happened.

After observing Figure 1, the participants were asked: –What do you see in the figure? –What is the main idea of this image? Afterwards, the question was repeated: –Could you indicate something more about? (See Figure 1).

![Figure 1. Toys](source: Own elaboration)

A normotypical participant does the following analysis:

**“First analysis:** It is a collection of children's toys...” (E

**“Second analysis:** These are toys for the little ones: different puppets and some games...” (E

A participant with ASD performs a structurally similar in first analysis, however, the second analysis is more much localized than in his neurotypical pair:

**“First analysis:** It is a room with toys...” (E

**“Second analysis:** There are many two bears, one blue and one pink color, there is also a brown dog, bunny-dolls with pink and blue colors, a little house with a children's room and different game pack...” (E

The first analysis is formally very similar, however, in the second analysis, the participants with ASD point out many more local elements of this figure to globalizing the intrinsic semantic content of the figure first analysis, however, it significant the first analysis is global in both groups.

But again, there is another important difference between groups. The normotypical participants get going personal deductions regarding stimulus observed, it was not required: "...For the little ones..." (E

**Quantitative analysis**

The statistical analysis of differential comparative of all study variables regarding "participant" variable has been accomplished.

The differential comparative analysis has been evaluated throughout the Non-Parametric for K Independent Samples Kruskal Wallis Test. Likewise, it owing to small and sensitivity sample size, the three statistical numeric digits are deepened.

Data indicated to the means (μ) and standard deviations (σ) of regarding analyzed variables indicate straggling over study variables (see Table 1).
Table 1. Descriptive Statistics (N: 10)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>(\mu)</th>
<th>(\sigma)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANalysis1</td>
<td>2.50</td>
<td>1.27</td>
</tr>
<tr>
<td>CANalysis2</td>
<td>3.60</td>
<td>1.50</td>
</tr>
<tr>
<td>Fanalysis1</td>
<td>1.40</td>
<td>.52</td>
</tr>
<tr>
<td>FFanalysis2</td>
<td>3.00</td>
<td>.82</td>
</tr>
<tr>
<td>Cdeduction</td>
<td>2.30</td>
<td>1.42</td>
</tr>
<tr>
<td>Fdeduction</td>
<td>2.10</td>
<td>.90</td>
</tr>
</tbody>
</table>

Note: *Grouping variable: “participant”.

Usually, all the mean statistical scores of the operating variables are distant from the data distribution, excluding the statistical mean of the “Fanalysis1” variable (\(\mu: 1.40, \sigma: .51\)) and “Fanalysis2” variable (\(\mu: 3.00, \sigma: .81\)). In fact, if one dimensional statistical calculation is realized for grouping of conceptual variables 1-2 and visual variables 1-2, configuring CANALYSIS (1-2) and FANALYSIS (1-2) dimensional variables, previously data has seen corroborated in Table 2.

Table 2. Dimensional Variables*

<table>
<thead>
<tr>
<th></th>
<th>CANALYSIS (1-2)</th>
<th>FANALYSIS (1-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>7.21</td>
<td>1.93</td>
</tr>
<tr>
<td>df</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.01</td>
<td>.17</td>
</tr>
</tbody>
</table>

Note: *Grouping variable: “participant”.

Data found indicate there are significant differences for both groups of participants ("participant") in the summary synthesis on the text-concept (sig: .00), however, there aren’t significant differences regarding to the figure-image analysis carried out (sig: .16).

As can be seen, the statistical ranks present significant differences in the two conceptual variables (\(\mu\neq: 5.00\)), as well as in the variables “Cdeduction” and “Fdeduction” (\(\mu\neq: 5.00\)). However, in the visual-figurative variables, the mean score to first analysis is similar to both participants group “Fanalysis1” (\(\mu: 5.50\)), while, in the “Fanalysis2” variable, there’re also mean differential on ranks (\(\mu\neq: 4.20\)), being significantly higher for group of participants with ASD (\(\mu: 7.60\)), compared the normotypical group (\(\mu\neq: 3.40\)).

In fact, the Kruskall Wallis Test indicates that differences found to “participant” variable had statistically significant for all the study analysis variables, but to “Fanalysis1” variable, which belonging to visual first analysis image, in which both groups of participants has answered in similar way (see Table 4).

Table 3. Comparative Ranks

<table>
<thead>
<tr>
<th>Variables</th>
<th>Participants group</th>
<th>N</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>CANalysis1</td>
<td>normotipical</td>
<td>5</td>
<td>3.00</td>
</tr>
<tr>
<td>ASD-1</td>
<td>5</td>
<td>8.00</td>
<td></td>
</tr>
<tr>
<td>CANalysis2</td>
<td>normotipical</td>
<td>5</td>
<td>3.00</td>
</tr>
<tr>
<td>ASD-1</td>
<td>5</td>
<td>8.00</td>
<td></td>
</tr>
<tr>
<td>Fanalysis1</td>
<td>Normotipical</td>
<td>5</td>
<td>5.50</td>
</tr>
<tr>
<td>ASD-1</td>
<td>5</td>
<td>5.50</td>
<td></td>
</tr>
<tr>
<td>Fanalysis2</td>
<td>Normotipical</td>
<td>5</td>
<td>3.40</td>
</tr>
<tr>
<td>ASD-1</td>
<td>5</td>
<td>7.60</td>
<td></td>
</tr>
<tr>
<td>Cdeduction</td>
<td>Normotipical</td>
<td>5</td>
<td>8.00</td>
</tr>
<tr>
<td>ASD-1</td>
<td>5</td>
<td>3.00</td>
<td></td>
</tr>
<tr>
<td>Fdeduction</td>
<td>Normotipical</td>
<td>5</td>
<td>8.00</td>
</tr>
<tr>
<td>ASD-1</td>
<td>5</td>
<td>3.00</td>
<td></td>
</tr>
</tbody>
</table>

Note: *Grouping variable: “participant”.

Table 4. Kruskal Wallis Test*

<table>
<thead>
<tr>
<th>Statistics</th>
<th>CANalysis1</th>
<th>CANalysis2</th>
<th>Fanalysis1</th>
<th>Fanalysis2</th>
<th>Cdeduction</th>
<th>Fdeduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>7.26</td>
<td>8.33</td>
<td>.00</td>
<td>5.40</td>
<td>8.04</td>
<td>8.33</td>
</tr>
<tr>
<td>Df.</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.01</td>
<td>.00</td>
<td>1.00</td>
<td>.02</td>
<td>.01</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note: *Grouping variable: “participant”.

Ranks comparative analysis indicates regarding to average differences inter-variables can see on Table 3.
The critical levels are significantly different for all variables, but the "Fanalysis1" variable, in which there are not significant differences between the groups.

However, it is of importance that “Canalysis1” variable, above-mentioned, regarding the first conceptual analysis, the significance level is relatively low (sig: .007), compared to Canalysis2 (sig: .004). This data is very important, as it indicates that initial perceptual level isn’t so biased-local in participants with ASD, which implies sure global content, although, it doesn’t have the global and semantic level of normotypical group.

For greater accuracy, the Jonckheere-Terpstra Test analysis has been carried out, which has a exactness statistical greater power (see Table 5).

<table>
<thead>
<tr>
<th>statistics</th>
<th>Canalysis1</th>
<th>Canalysis2</th>
<th>Fanalysis1</th>
<th>Fanalysis2</th>
<th>Cdeduction</th>
<th>Fdeduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant levels</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Observed J-T Statistic</td>
<td>25.00</td>
<td>25.00</td>
<td>12.50</td>
<td>23.00</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>Mean J-T Statistic</td>
<td>12.50</td>
<td>12.50</td>
<td>12.50</td>
<td>12.50</td>
<td>12.50</td>
<td>12.50</td>
</tr>
<tr>
<td>Std. Deviation of J-T</td>
<td>4.64</td>
<td>4.33</td>
<td>4.08</td>
<td>4.52</td>
<td>4.41</td>
<td>4.33</td>
</tr>
<tr>
<td>Std. J-T Statistic</td>
<td>2.69</td>
<td>2.89</td>
<td>.00</td>
<td>2.32</td>
<td>-2.84</td>
<td>-2.89</td>
</tr>
<tr>
<td>Asymp. Sig. (2-tailed)</td>
<td>.01</td>
<td>.00</td>
<td>1.00</td>
<td>.02</td>
<td>.01</td>
<td>.00</td>
</tr>
</tbody>
</table>

Note: *Grouping variable: “participant”.

Data found are similar to K-W test in strict sense, in which a slightly low differential critical level in the variable “Canalysis1” has observed (sig: .007), while other variables scores are highly significant to confidence level of .05. It is noteworthy that no differences on “Fanalysis1” variable are observed (sig: 1.000).

Likewise, the significant differential scores concerning “Cdeduction” (sig: .005) and “Fdeduction” dimensional variables (sig: .004), were broadly significant regarding group way. Indeed, people with ASD are limited to information content description, while normotypical participants also general deductive improvisations have been developed, owing, above all, to ability to process neural relationships of previously semantically memorized knowledge.

Study Limitations

It is necessary to highlight that this study has formed by small sample, which requires a highest size research to corroborate these conceptual approaches. Likewise, the study just related to ASD level 1, therefore, it’d be necessary to include ASD’s levels 2 and 3 in future studies.

Conclusions

According to data found, it is possible conclude that perceptual-cognitive processing of people with ASD set right to one propositional cycle, that has been denominated Global Cyclic Theory (GCT) (see Figure 2).

This new hypothesis of ASD’s specific processing partially corroborates previous perceptual theories, however it gives some very significant peculiarities.

Firstly, the first conceptual perceptual analysis is differentially significant inter-groups, but participants with ASD also show any semantic-global content next to normotypical group, although it has found a lower semantic level (sig: .007).
Figure 2. Global Cyclic Theory (GCT)*

Source: Own elaboration.


Secondly, it is corroborated there are hardly any differences in the first visuospatial analysis regarding the first analysis of the spatial figure.

And, thirdly, the executive action of nodal-neural relationships influencing the whole propositional conceptual process throughout continuous circular way.

Thus, psychoneurological processing turns systemically as a whole throughout the sensorial-perceptual-cognitive process around of the neural networks interaction (RN), hence that deficits on formation of conceptual nodal relationships will affect the whole cognitive-perceptive system, as happen in the ASD group processing.

The first textual-conceptual cognitive analysis is globally in both groups, although you have found less semantic content in ASD group, therefore, there isn’t significant level, although it has been close (sig: .007). However, in the visuospatial-figurative content no significant differences have been found, but it is smaller semantic level, configuring a partial global perception in the people with ASD (GP).

The first global input in people with ASD shapes a quite general idea, hence, at once, in a second conceptual analysis, the meaning relationships with previous knowledge related (RN), throughout semantic localization interconnected to new informative input (CP).

But, owing the needs in establishing these relationships in people with ASD, along second phase of the conceptual analysis, they try analyze all possible local- elements of the information included. Each conceptual local- unit explored has been related to the previously content known (RN), in order to out-and-out the initial semantic perceptive content (UC). This second conceptual successive analysis will be greater the lower the first global semantic attribution.

Afterward, the semantic executive attribution of conceptual units must be organized into related conceptual categories, agreeable to their similarities and/ or differences (C). Therefore, it
is now possible that working memory (WM) can allows access information to permanent (semantic) memory, where it’ll stay timeless.

From the access of this information to semantic memory, it is possible the information perceived could be understood as a whole within memory is deepen (GT).

At last, the semantic global knowledge already cognitive attribute allows the elaboration of deep relationships between conceptual- categories throughout, also, the activity of neural- nodes relationships. (RN), which, successively, develop the progressive increase in human knowledge (Cn).

In semantic memory, conceptual categories may persist as itself or integrate as a subcategory of another existing higher category, which make possible the cognitive economy necessary along global semantic cognitive functioning of processing information neuropsychological system.

But, this full process, which is influenced, of course, by previously conceptual- categorical relationships, also it is conditional by all basic neuropsychological processes (Ojea, 2017), such, as sensory- attention, interest level in the task, personal motivation, cognitive level, codification process, WM functioning, context reaction and environment way.

References


