Wechsler profiles in referred children with intellectual giftedness: Associations with trait-anxiety, emotional dysregulation, and heterogeneity of Piaget-like reasoning processes

Fabian Guénelé, Mario Speranza, Jacqueline Louis, Pierre Fourneret, Olivier Revol, Jean-Marc Baleye

BACKGROUND/PURPOSE: It is common that intellectually gifted children (IQ ≥ 130) are referred to paediatric or child neuropsychiatry clinics for socio-emotional problems and/or school underachievement or maladjustment. Among them, those displaying developmental asynchrony – a heterogeneous developmental pattern reflected in a significant verbal-performance discrepancy (SVPD) on Wechsler's intelligence profile – are thought to be more emotionally and behaviourally impaired than others. Our purpose was to investigate this clinical dichotomy using a cognitive psychopathological approach.

METHODS: Trait-anxiety and emotional dysregulation were investigated in two groups of referred gifted children (n = 107 and 136, respectively), a pilot-study of reasoning processes on extensive Piaget-like tasks was also performed in an additional small group (n = 12).

Abbreviations: AB, aggressive behaviour; AD, anxious/depressed; AP, attention problems; ASD, autism spectrum disorders; CBCL, child behaviour checklist; CBCL-DP, child behaviour checklist-dysregulation profile; IQ, intellectual quotient; LTDS, logical thought development scale; NVLD, nonverbal learning disability; R-CMAS, revised-children's manifest anxiety scale; RHI, reasoning homogeneity index; SVPD, significant verbal-performance discrepancy.

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Dysregulation profiles
Intelligence
Psychometrics

Results: Compared to those with a homogenous Wechsler profile, children with a SVPD exhibited: 1) a decreased prevalence of social preoccupation-anxiety (11.1% versus 27.4%; \( p < 0.05 \)); 2) an increased prevalence of emotional dysregulation (58.7% versus 41.3%; \( p < 0.05 \)); and 3) an increased prevalence of pathological cognitive disharmony on Piaget-like tasks (87.5% versus 0.0%; \( p < 0.05 \)).

Conclusion: The results support a clinical dichotomy of behaviourally-impaired children with intellectual giftedness, with developmentally asynchronous ones exhibiting more severe psychopathological features. This suggests that developmental asynchrony matters when examining emotional and behavioural problems in gifted children and call for further investigation of this profile.

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1. Introduction

Although the whole population of intellectually gifted children – i.e. children with an intellectual quotient (IQ) \( \geq 130 \), according to the main and most consensual definition\(^1\) – displays no apparent increase in psychiatric morbidity,\(^2\) it is highly common that certain of them are referred to paediatric or child neuropsychiatry clinics for socio-emotional problems and/or school underachievement or maladjustment.\(^6\)\(^–\)\(^10\) Such children display internalizing behavioural and emotional problems (self-focused problems reflecting overcontrol of emotion and behaviour: anxiety,\(^11\) social withdrawal,\(^12\)\(^,\)\(^13\) low self-esteem,\(^14,\)\(^15\) or excessive perfectionism\(^11\)), and also a range of externalizing problems (acted-out problems reflecting undercontrol of emotion and behaviour: psychomotor instability, irritability, or aggressive behaviour, for example\(^1\)). Though little is known about the validity and diagnostic specificities of categorical mental disorders in this specific population, the common observation of behavioural problems in gifted children without an increased prevalence of categorical mental disorders in the whole gifted population suggests that it is heterogeneous,\(^10,\)\(^16\) and also inclines towards a dimensional psychopathological approach.\(^15,\)\(^17\)

A notion usually considered when interpreting socio-emotional and educational maladjustment of gifted children is developmental asynchrony,\(^18,\)\(^19\) which designates a problematic pattern of heterogeneities frequently seen in the development of gifted children, between cognitive, emotional, and psychomotor levels. Psychometrically, developmental asynchrony may be reflected on Wechsler's IQ tests in the verbal-performance discrepancy,\(^2\) which quantifies the cognitive imbalance between abilities in verbal and nonverbal reasoning.\(^20\) Examination of the verbal-performance discrepancy is the hallmark of Wechsler's intelligence profile analysis, with a value \( \geq 15 \) being considered as significant and indicative of an abnormal profile.\(^20,\)\(^21\) A significant verbal-performance discrepancy (SVPD) is seen in approximately one quarter of gifted children,\(^22\) and was found associated with social and school maladjustment.\(^23\) Some data suggest that it is more frequent in gifted children who are clinically-referred than others,\(^8,\)\(^10,\)\(^24\) and, in a recent study using Achenbach's dimensional approach of childhood psychopathology,\(^25\) SVPD was associated with externalizing behavioural problems and internalizing-externalizing mixed behavioural syndromes.\(^10\) These data fit a hypothesis set by Gibello,\(^26,\)\(^27\) who schematized a psychopathological dichotomy of clinically-referred gifted children: a first and main category would include intellectually homogeneous children who manifest internalizing symptoms and social maladjustment in relation to precociously mature self-reflectiveness; a second category is thought to comprise asynchronous children, who early develop externalized or mixed behavioural syndromes and display more severe psychopathological mechanisms and disturbances.

The present paper reports three studies, which investigated the hypothesis just mentioned by comparing psychopathological profiles of clinically-referred gifted children with and without a SVPD. Study one explores trait-anxiety and its dimensions across Reynolds' model\(^20\); study two investigates emotional dysregulation through Achenbach's dimensional psychopathology\(^25\); and study three applies a clinical neo-Piagetian approach of reasoning processes.\(^29\)

2. General methodological information

The three groups of gifted children were successively recruited at outpatient child psychiatry clinics specialized in the psychopathology of gifted children and through the private practice of pediatricians and psychologists, where they were referred because of socio-emotional problems and/or school underachievement or maladjustment. All children had a full-scale IQ \( \geq 130 \) on the French version of the Wechsler Intelligence Scale for Children-Third Edition\(^28\); SVPD was defined as a verbal-performance discrepancy \( \geq 15 \). No child was diagnosed as suffering from any categorical mental disorder of the Diagnostic and Statistical Manual of Mental Disorders, fourth version revised,\(^30\) after examination by trained psychiatrists and psychologists.

The research was conducted in accordance to the declaration of Helsinki and to the French law regarding research involving the Human person. Parents of each child signed for informed consent after having been informed about the research and its purposes.
3. Study A: trait-anxiety

Trait-anxiety is the stable and general propensity for an individual to experience anxious feelings and behaviours. Though it is mainly linked to the internalizing range of emotional-behavioural problems, it is also considered as a broad marker of childhood psychopathology. We used here Reynolds’ model of childhood trait-anxiety, as operationalized in the Revised-Children’s Manifest Anxiety Scale (R-CMAS).34

3.1. Material and methods

The studied group consisted of 107 children (27 girls and 80 boys), aged 8 to 11 (mean: 9.6 ± 1.4 years). As described in a previous report, of these gifted children displayed significant dimensional trait-anxiety according to the French version of the R-CMAS.34

The R-CMAS is a 37-item self-assessment of trait-anxiety in children and adolescents from eight to eighteen. It provides a “Total Anxiety” score, and three dimensional sub-scores: “Physiological Anxiety” reflects the somatic manifestations of trait anxiety; “Worry and Oversensitivity” reflects anxious ruminations and anticipation of affective distress; and “Social Preoccupation” reflects feelings of inferiority, insufficiency, loneliness, disapproval and hostility from others. The dimensional structure of the R-CMAS has been demonstrated in general population samples, and specifically in gifted children. It has been confirmed within the French version, as well as the scale’s other psychometric properties. On the basis of results obtained in general population samples, the French R-CMAS displays normalized scores with cutpoints for the detection of trait-anxiety (>60.0 for the TA score and >13.0 for the three subscales). Proportions of individuals whose score or subscores exceeded these cutpoints were compared across gifted children with and without a SVPD, using chi-square tests.

3.2. Results

Results are summarized in Table 1. Forty-five of the 107 children (42.1%) displayed a SVPD, which was in favour of verbal intelligence in 43 (95.6%) of them; this group comprised 9 girls and 36 boys. The non-SVPD group (n = 62) comprised 18 girls and 44 boys.

Proportions of a significant Total Anxiety score did not differ significantly between children with and without a SVPD (22.2% versus 19.7%, respectively). There was significantly more children with a significant Social Preoccupation subscore among those without a SVPD than others (27.9% versus 11.1%, respectively; p < 0.05), other comparisons showed no significant difference.

3.3. Discussion

Prevalence of total trait-anxiety cases did not differentiate children with and without a SVPD. Since trait-anxiety has been considered as a broad marker of childhood psychopathology, this result suggests that, among gifted children who are clinically-referred, asynchronous and intellectually homogeneous ones do not clearly differ as for their levels of general psychopathology. Comparisons regarding the physiological and worry/oversensitivity dimensions of the R-CMAS neither distinguished both groups (though proportion of physiological anxiety cases tended to be higher in the SVPD group); what significantly differentiated the two groups was social preoccupation only, which cases were significantly more prevalent in the non-SVPD group.

The social preoccupation dimension of the R-CMAS model refers to self-assessed feelings of loneliness, disapproval and hostility from others, inferiority and insufficiency. The results thus suggest that self-conception of such feelings is less frequent in maladjusted children with asynchronous giftedness compared to intellectually homogeneous ones. Self-concept and its metacognitive prerequisites has been found precociously mature in general samples of gifted children, which have been hypothesized favouring maladjustment and internalizing problems among them. Maladjusted children with asynchronous giftedness seem not to fulfil this pattern, and it could be hypothesized that the lower frequency of social preoccupation cases among them may reflect a relative weakness in self-concept. Such a weakness could keep them out of fully apprehending their maladjustment, its social repercussions (loneliness, hostility from others) and experiencing related negative feelings (feelings of inferiority and insufficiency). This hypothesis calls for investigations of self-concept and metacognition in developmentally asynchronous children with intellectual giftedness.

4. Study B: emotional dysregulation

Emotional dysregulation is a subthreshold diagnostic category proposed to reflect the common clinical cases of children who display impaired self-regulation in the form of concurrent disturbance in the domains of attention, trait and state mood regulation (chronic irritability, mood instability and affective storms) and control of behaviour (hyperarousal, impulsivity, etc.).

Table 1 – Proportions of children with significant R-CMAS scores across SVPD and non-SVPD groups.

<table>
<thead>
<tr>
<th>R-CMAS scores</th>
<th>Gifted children (n = 107)</th>
<th>Without a SVPD (n = 62)</th>
<th>χ²</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total anxiety ≥60</td>
<td>10 (22.2%)</td>
<td>12 (19.4%)</td>
<td>0.131</td>
<td>0.72</td>
</tr>
<tr>
<td>Physiological anxiety ≥13</td>
<td>12 (26.7%)</td>
<td>8 (12.9%)</td>
<td>3.250</td>
<td>0.07</td>
</tr>
<tr>
<td>Worry and Oversensitivity ≥13</td>
<td>14 (31.1%)</td>
<td>15 (24.2%)</td>
<td>0.632</td>
<td>0.43</td>
</tr>
<tr>
<td>Social preoccupation ≥13</td>
<td>5 (11.1%)</td>
<td>17 (27.4%)</td>
<td>4.246</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

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aggression. Though there is no absolute consensus regarding the precise definition of the syndrome, Achenbach’s dimensional approach allowed individualizing an emotional and behavioural pattern, consisting of elevations on the attention problems, aggressive behaviour and anxious/depressed subscales of the Child Behaviour Checklist (CBCL), which has been termed the “dysregulation profile” (CBCL-DP). Since children with distributed behavioural problems frequently suffer from emotional dysregulation, clinically-referred gifted children with a SVPD, who preferentially exhibit mixed behavioural syndromes, may display a CBCL-DP more frequently than gifted children with homogeneous IQs.

4.1. Materials and methods

The studied group consisted of 136 children (41 girls and 95 boys), aged 8 to 11 (mean: 9.3 ± 1.0 years). As described in a previous report, 76 (55.9%) of these gifted children displayed significant behavioural, emotional, and social problems according to Achenbach’s CBCL profile analysis. In parallel, a group of children matched one-to-one with the “gifted” group for age and sex was recruited in five primary schools for establishing normative CBCL data.

The CBCL is an internationally recognized device for psychopathological assessment in children and adolescents. It consists of 118 statements about which parents are asked to enter their child considering the last six months. It provides a morbidity quantification, spatial representation, and hypothetical-deductive reasoning. The logical strategy used by the subject consists of five tasks, each of which involves a logical structure: invariance of physical quantities, permutation, probability quantification, spatial representation, and hypothetical-deductive reasoning. The logical strategy used by the subject

| Table 2 | Proportions of children with a CBCL-DP across SVPD and non-SVPD groups. |
|---------------------------------|------------------|------------------|
| CBCL-Dysregulation profile | Gifted children (n = 136) |  |
| | With a SVPD (n = 46) | Without a SVPD (n = 90) |
| Present | 19 (41.3%) | 22 (24.4%) |
| Absent  | 27 (58.7%) | 68 (75.6%) |
| \( \chi^2 = 4.11; p < 0.05 \) |

4.2. Results

Results are summarized in Table 2. Forty-six of the 136 children (33.8%) displayed a SVPD, which was in favour of verbal intelligence in 44 (95.7%) of them; this group comprised 10 girls and 36 boys. The non-SVPD group (n = 90) comprised 31 girls and 59 boys.

Forty-one children (30.1%) displayed a CBCL-DP. There were significantly more children with a CBCL-DP among those with a SVPD than others (41.3% versus 24.4%, respectively; \( p < 0.05 \)).

4.3. Discussion

According to our results, SVPD may be linked to emotional dysregulation in gifted children. Emotional dysregulation includes concurrent disturbances in the domains of attention, trait and state mood regulation (chronic irritability, mood instability and affective storms) and control of behaviour (hyperarousal, impulsivity, aggression), and represents a developmental heterogeneity entailing impairment in multiple psychological domains. It appears early and is stable across development, and is currently conceptualized as a broad disorder of self-regulation, which constitutes an early developmental risk marker for long-term affective morbidity. Indeed, emotional dysregulation is a robust predictor of future negative outcomes, with a high risk when entering adulthood for a series of affective disorders.

5. Study C: Piaget-like reasoning processes

Whereas SVPD is a well-established indicator of cognitive imbalance, it remains a relatively basic one, and it could be useful in future research to characterize developmental asynchrony more precisely. We report here a pilot-study using Piagetian concrete and formal operational tasks, which combination with IQ tests allows a deeper examination of cognitive imbalance.

5.1. Material and methods

The studied group consisted of 12 gifted children (2 girls and 10 boys) aged 7 to 15 (mean: 10.5 ± 1.4 years), who were administered the Logical Thought Development Scale (LTDS; Echelle de Développement de la Pensée Logique). The LTDS is an extensive tool for the investigation of reasoning processes in the child, based on the experimental works and developmental model of Piaget and Inhelder. It consists of five tasks, each of which involves a logical structure: invariance of physical quantities, permutation, probability quantification, spatial representation, and hypothetical-deductive reasoning. The logical strategy used by the subject
on each task is scored from one to five, depending on its level within the developmental hierarchy of reasoning processes (pre-operational, concrete operational A and B, formal operational A and B), which has been standardized in several general samples.60 This allows calculating a reasoning homogeneity index (RHI),62 ranging from 0 to 100, which decreases with the number of spreads between levels in the different logical domains. It reflects the subject’s balance of reasoning processes, with a RHI ≤70 denoting a significant heterogeneity within them.63 Proportions of individuals with a RHI ≤70 were compared between children with and without a SVPD, using Fisher’s exact test.

5.2. Results

Results are summarized in Table 3. Eight of the 12 children (66.6%) displayed a SVPD, which was in favour of verbal intelligence in 7 (87.5%) of them; this group comprised 1 girl and 7 boys. The non-SVPD group (n = 4) comprised 1 girl and 3 boys.

Seven children (58.3%) displayed a RHI ≤70. There were significantly more children with a RHI ≤70 among those with a SVPD than others (87.5% versus 0.0%, respectively; p < 0.05).

5.3. Discussion

The proportion of children with a RHI ≤70 was significantly higher in the SVPD group than in the non-SVPD one. Though very preliminary, this pilot result suggests that developmental asynchrony in gifted children may correspond to a significant heterogeneity of reasoning processes.

Gifted children display rapid knowledge accretion, which reliance on experiencing contact with their physical and social environments thus has comparatively less weight than for intellectually ordinary children. Probably because a number of skills are necessarily dependent on chronological age (such as perception or motor function, for examples), this situation seems to favour heterogeneity within reasoning processes.65–68 While some discrepancies of minor amplitude within reasoning processes are indeed common among gifted children during periods of their development65–67 (normal cognitive disharmony68), they are quantitatively incommensurate with significant heterogeneity of reasoning processes as operationalized in the LTDS, which represents a pathological cognitive disharmony.27,63,64 Moreover, normal cognitive disharmony (70 < RHI < 9565) is typically provisional, as it alternates with periods entailing homogeneous functioning.67,68 Indeed, it is thought that propensity for reasoning heterogeneity in gifted children is normally attenuated through heightened capabilities in analogical reasoning processes67,68,70 i.e. inductive processes relying on similarity identification,71 which foster transfer between reasoning domains.72,73 Following a neo-Piagetian framework, it could be hypothesized that gifted children with a pathological cognitive disharmony display lack of compensatory analogical reasoning or other executive resources.

It must be acknowledged that small sample size limits here statistical significance and generalizability of results. Further investigation of reasoning processes in referred gifted children with and without a SVPD would thus be necessary to confirm its association with pathological cognitive disharmony.

6. General discussion

The three studies suggest that, within referred gifted children, those with a SVPD exhibit 1) a decreased prevalence of social preoccupation; 2) an increased prevalence of emotional dysregulation, and 3) an increased prevalence of pathological cognitive disharmony, compared to those with homogeneous Wechsler profiles. As a whole, this suggests that SVPD is a relevant variable, which contributes distinguishing two subgroups within referred children with intellectual giftedness.

The first subtype — which may be slightly more frequent than the second one according to our group sizes — includes gifted children with homogeneous Wechsler profiles, who manifest internalizing symptoms and social maladjustment in relation to precociously mature self-concept.14,37,38 With these children, extended self-concept would lead to a hyper-monitoring of errors and adversity, and thus to overcontrol of emotion and behaviour.57,68 This might be envisaged as a childhood variant of Wells’ cognitive-attentional syndrome,74 a cognitive-behavioural style characterized by extended metacognition, with excessive self-focused attention and threat-monitoring.75 Although the development of reasoning processes in these children may be non-linear (as for gifted children in general66–68), it remains relatively equilibrated, without pathological cognitive disharmony. This whole pattern could be subsumed under the term “metacognitively maladjusted giftedness”.

The second subtype includes children with a SVPD, who exhibit externalized or mixed behavioural syndromes,10 especially in the form of emotional dysregulation, and low metacognitive skills. In this second subtype, more developmentally driven, a broad disorder of self-regulation would lead to pathological cognitive disharmony, of which SVPD could be a reflect. In the field of psychopathology, SVPD is a classical feature of Asperger syndrome,76 a high-functioning form of autism spectrum disorder (ASD), with which referred children with intellectual giftedness often share characteristics of verbal precocity, hyperlexia, hypercalculia, semantic hypermnesia, absorbing interests in specialized topics (with limited social sharing), social withdrawal, anxiety, excessive perfectionism, perceptive hypersensitivity, and motor clumsiness. Intellectual giftedness is common in moderate forms of ASDs,78–80 where this co-occurrence has been conceptualized as one of “twice-exceptionalities”.80 These children with ASDs and intellectual giftedness exhibit both internalizing and externalizing

| Table 3 – Proportions of children with a RHI ≤70 across SVPD and non – SVPD groups. |
|---------------------------------|---------------------|---------------------|
| Reasoning homogeneity index     | Gifted children (n = 12) | Without a SVPD (n = 4) |
| RHI<70                          | 7                   | 0                   |
| RHI>70                          | 1                   | 4                   |
| p < 0.05.                       |                     |                     |

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behavioural problems.80 As ASDs are thought to represent the high-level co-occurrence of continuously distributed quantitative traits,81 it could be hypothesized that gifted children with a SVPD, emotional dysregulation, and a pathological cognitive disharmony, may be situated at the border of such developmental atypicalities entailing multiple impairments in high-order cognitive functioning.82

SVPD is also a feature of nonverbal learning disability (NVLD), or “Rourke’s syndrome”, which clinical manifestations includes neuropsychological impairment in the domains of arithmetic, spatial cognition, and nonverbal aspects of social cognition, together with a series of right-sided neurological soft-signs.83,84 NVLD is conceptualized as a right-hemisphere developmental dysfunction,85,86 and has also been reported in patients with corpus callosum agenesis.85,86 Interestingly, NVLD entails chronic social maladjustment,83,84 as it is the case for children in our research. It could thus be addressed in future research whether or not a significant proportion of maladjusted children with asynchronous giftedness display a NVLD, or similar neurodevelopmental abnormalities involving mild interhemispheric disconnection/lack of hemispheric lateralization or right-sided neurological soft signs.

In our opinion, the intellectual pattern found in our second subtype of maladjusted children with high IQ should not be considered simply as intellectual giftedness, but rather as a “high-functioning pathological cognitive disharmony”. Thorough investigations of emotional regulation, self-concept and inductive reasoning processes would be useful in children with this profile, along with investigations of executive/inhibitory control. Indeed, it may be possible that the whole cognitive and behavioural pattern relies basically to insufficient executive/inhibitory control which, besides its involvement in self-regulation, play a central role in the development of analogical reasoning,87,88 and cognitive equilibration in general.89,90 This would be consistent with the fact that attentional, working memory and executive resources have been found lowered in referred gifted children with a SVPD compared to intellectually homogeneous ones.91

6.1. Limits

Some limitations have already been acknowledged; we mention here additional ones which are shared by our three studies.

The first one concerns definition of intellectual giftedness on the single basis of IQ testing, which has intrinsic limits.92 Since IQ scores are defined through confidence intervals, and may vary in a mean range of approximately 5% in gifted children,93 categorization involves a small risk of error when IQ score approaches the cut-off of 130. This bias is inherent to categorization from a continuous variable which has a measure fluctuation, and its effect diminishes with statistical power. More generally, it reflects the fact that clear-cut IQ definition of giftedness entails a certain methodological reductionism. Though this definition is the minimal and most consensual one,1,2 it must also be mentioned that intellectual giftedness has been conceptualized as involving additional features, such as heightened emotional abilities and/or creative talent,94,95 and probably not all children in our research would have corresponded to such multiple-trait definitions of giftedness. This distinction between creative/emotionally talented and atypical subtypes of high intelligence should be investigated in future research.

We neither made a distinction in our three studies between SVPD in favour of Verbal or Performance IQ. Indeed, SVPD in favour of Performance IQ was so infrequent that children with this pattern could not be regarded as distinct group in each of our statistical comparison, which led us to pool both SVPD patterns. Comparison between gifted children with both SVPD subtypes could thus be another interesting issue for future research.

Since the three studies we report here were designed before the publication of the fifth version of the Diagnostic and Statistical Manual of Mental Disorders,96 clinical evaluation did not considered the new “Disruptive mood dysregulation disorder” category, which is known to overlap with emotional dysregulation.97 It is likely that a number of children would have corresponded to the definition of this disorder, and thus not remained “nosologic orphans”.31 Whatever, it is well-established that a significant proportion of children with behavioural problems do not enter current classifications of mental disorders,98,99 whereas they display clear-cut dimensional psychopathology.25,100 This particular applies to children with emotional dysregulation,40 which justifies using dimensional models of childhood psychopathology.25,99

Finally, since their distinction rests on cross-sectional group comparison statistics, the two subtypes of gifted children we described should be currently considered as prototypes,101 which full characterization needs to be investigated and confirmed longitudinally.

6.2. Conclusions

This research suggests that SVPD matters when considering emotional and behavioural problems in gifted children, and could be a risk indicator for psychopathology. This profile could also matter for school teachers, when adapting pedagogical support to the cognitive specificities of these children.

More generally, our results support a clinical dichotomy of behaviourally-impaired children with intellectual giftedness, which precise definition and adapted therapeutic approaches need to be investigated thoroughly, in a developmental perspective and with long-term purposes.

Declaration of competing interest

The authors declare that they have no competing interests.

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