The usefulness of the Multidimensional Health Locus of Control Form C (MHLC-C) for HIV+ subjects: An Italian study

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In the last few years, highly active antiretroviral therapy (HAART) has resulted in a remarkable decrease in HIV-related morbidity and mortality (Hogg et al., 1998; Palella et al., 1998, 2003). Nevertheless, it’s widely believed that adherence is a key factor in determining whether or not the patient will derive sustained benefit from the antiretroviral therapy (Paterson et al., 2000).

Many studies on adherence have limited themselves to dealing with the subjects’ ‘manifest behaviour’ only, therefore assessing the association between evident variables and the subjects’ adherence to the treatment prescribed. They have tended to neglect other features of the subjects, such as psychological and interpersonal styles, which are, instead, closely linked to the adherence phenomenon (Ironson et al., 2005). On the other hand, it seems essential to take into account a person’s beliefs regarding his/her own health status-beliefs, which are likely to influence both treatment-linked behaviours and quality of life, too (Penedo et al., 2003).

In particular, Locus of Control, a construct derived from social learning theory (Rotter, 1954), has proved to be helpful in predicting and explaining specific health-related behaviours (Strudler-Wallston & Wallston, 1978).

According to this approach, individuals can be divided into two main groups: those who believe that their state of health (or sickness) is a result of their own behaviour (“health-internals”) and those who consider that the factors that determine their health are generally such things as chance or powerful others, factors over which they have poor control (“health-externals”) (Wallston, Wallston, Kaplan, & Maides, 1976).

Wallston and colleagues later demonstrated the importance of assessing beliefs concerning the influence of chance and of powerful others separately (Wallston, Wallston, & DeVellis, 1978). More recently, Wallston, Stein and Smith (1994) have shown that it is also useful to discriminate between expectancies related to doctors and those related to other significant people (e.g., relations, friends, etc.) within the powerful others construct.

They thus developed the Multidimensional Health Locus of Control scale-Form C (MHLC-C), an 18-item self-administered questionnaire, useful for assessing Locus of Control beliefs with any medical- or health-related condition. Items are rated on a six-point

Keywords: locus of control; health-related beliefs; relational style; MHLC-C

Introduction

In the last few years, highly active antiretroviral therapy (HAART) has produced a remarkable decrease in HIV-related morbidity and mortality (Hogg et al., 1998; Palella et al., 1998, 2003). Nevertheless, it’s widely believed that adherence is a key factor in determining whether or not the patient will derive sustained benefit from the antiretroviral therapy (Paterson et al., 2000).

Many studies on adherence have limited themselves to dealing with the subjects’ ‘manifest behaviour’ only, therefore assessing the association between evident variables and the subjects’ adherence to the treatment prescribed. They have tended to neglect other features of the subjects, such as psychological and interpersonal styles, which are, instead, closely linked to the adherence phenomenon (Ironson et al., 2005). On the other hand, it seems essential to take into account a person’s beliefs regarding his/her own health status-beliefs, which are likely to influence both treatment-linked behaviours and quality of life, too (Penedo et al., 2003).

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Likert scale, where 1 = strongly disagree and 6 = strongly agree. The MHLC-C provides scores of four subscales: Internality, which measures an individual’s tendency to believe that health outcomes are due mainly to his/her own behaviour (6 items); Chance, which measures the extent to which one believes that health/illness is a matter of fate or luck (6 items); Doctors, which measures an individual’s beliefs about the degree of control doctors have over condition-specific outcomes (3 items); and Other People, which measures how far an individual expects that ‘powerful others’ such as relations or friends may contribute to his/her health condition outcome (three items).

Since the Italian version of MHLC-C has never been reliably validated, we first needed to assess its psychometric properties (i.e., factor structure, reliability, etc.). Moreover, two more samples of chronic patients (from the fields of Cardiac Surgery and Cancer) were given the test, for the specific purpose of characterizing the MHLC-C profile of the HIV+ patients. To test the differences between groups, the critical assumption is that the scales should measure the same traits in all of them (e.g., Borsboom, 2006). If such an assumption holds, then comparisons and analyses of scale scores are acceptable and yield meaningful interpretations.

Starting from these premises, and by using the MHLC-C, the main goal of this study was to try and add to our knowledge of how HIV+ patients view, understand and think about their complex health condition, focusing specifically on their individual beliefs. The resulting profile is then compared to those of other types of patients.

**Method**

Wallston’s MHLC-C was administered to 478 HIV+ subjects (%F = 28.5), ranging from 18 to 50 years of age (M = 38.9 ± 6.1) and from 5 to 18 years in formal education (M = 11.8 ± 3.6). In terms of marital status, most subjects were single (54.8%) and a lower percentage married (21.8%). Adherent subjects (56.1%) were identified on the grounds of the Patterson (Paterson et al., 2000) cut-off criterion of 95% of correct therapy taking during the past month. Factor structure was investigated by means of Principal Axes Factor Analysis (PAF) with Promax Axes Rotation. The number of underlying dimensions was assessed by means of Scree-test (ST, Cattell, 1966), Parallel Analysis (PA, Horn, 1965) and the Minimum Average Partial (MAP) Correlation statistic (Velicer, 1976). Cronbach’s Alpha was used to evaluate internal consistency of MHLC-C subscales. The fit of two-, three- and four-factor models was assessed through Maximum Likelihood Confirmatory Factor Analyses (ML-CFA). Having determined the best fitting model, its factor structure invariance (i.e., generalizability) across different subsamples (defined by being adherent or not to anti-retroviral therapy, by gender and by random splitting) was then tested through the same statistical method. For this purpose, pattern coefficients (i.e., factor loadings) and factor variances and covariances were subsequently constrained to be equal across groups. Differences between all these nested models were again assessed through ML-CFA.

In order to correct for substantive non-normal multivariate distribution of item scores, Satorra-Bentler’s scaled Chi-Square statistics (SB-$\chi^2$) (Satorra & Bentler, 1988) were used to evaluate model fit and differences in fit between nested models. Given that the relatively large sample size would be too likely to lead to a statistical rejection of the hypothesized models, a number of widely used descriptive indices for assessing model fit were used: the SB-$\chi^2$ to degrees of freedom ($df$) ratio (Schermelleh-Engel, Moosbrugger, & Müller, 2003), the Root Mean Square Error of Approximation (RMSEA) (Steiger, 1990), the robust estimates (Satorra & Bentler, 1988) of Non-Normed Fit Index (NNFI*) and Comparative Fit Index (CFI*) (Bentler, 1990), and the Standardized Root Mean Square Residual (SRMR) (Bentler, 1995). Hu and Bentler’s (1999) cutoff values for optimal fit were used. Both standardized residuals and modification indices were consulted for identifying model misspecification in the process of establishing the baseline model for each group. A difference of 0.01 in the value of NNFI* and CFI* between the baseline and the constrained models was considered as the index of substantial difference in fit (Cheung & Rensvold, 2002; Marsh, 1994; Vandenberg & Lance, 2000).

In order to give an accurate picture of the HIV+ patients’ MHLC-C profile, the scale was also administered to 70 cardiac surgery patients (%F = 27.1, mean age 55.9 ± 12.0 years, mean education 10.5 ± 4.2 years) and 108 cancer patients (%F = 66.3, mean age 54.3 ± 13.4 years, mean education 10.7 ± 3.9 years). Factor structure generalizability across the three groups of patients was assessed through the same ML-CFA procedure described above. This procedure was used to provide evidence that the scales measured the same traits in all of the groups, thus enabling a reliable comparison of group means.

To test differences between groups in mean scale scores, a Mixed Factorial Analysis of Covariance (mixed ANCOVA) was performed, taking into account scale mean scores as repeated measure factor, gender and diagnosis as between-subjects factors and age and education as covariates. In order to test differences in subscale scores, given the different
number of items in the MHLC-C scales, each subscale score was computed as the mean of item scores. Statistical analyses were carried out through SPSS 10.0 (SPSS, 1999) and LISREL 8.52 (Jöreskog & Sörbom, 2002).

Results

ST and PA indicated that four latent dimensions could adequately represent systematic inter-item covariation. PAF showed that a four-factor solution accounted for 47.523% of total variance. All items loaded on the expected factor, with factor loadings ranging from 0.302 to 0.839. Low to moderate correlations were observed among the factors. The MAP statistic suggested a two-factor solution, in which items defining Others were compared to the three-factor solution, in which items defining Others loaded on the expected factor, with factor loadings accounted for 47.523% of total variance. All items ranged from 0.302 to 0.839. Low to moderate correlations were observed among the factors. The PAF showed that a four-factor solution mostly due to a difference in the Internality and Chance scales of cardiac males, who have higher scores than cardiac females on the former scale (Bonferroni-adjusted $t = 2.27$, $p = 0.024$), and lower on the latter (Bonferroni-adjusted $t = 2.78$, $p = 0.006$). Table 2 shows the details of Bonferroni-adjusted post-hoc tests performed for the total sample on the scale levels, for each diagnostic group on the scale levels and for each scale on the diagnosis levels.

These results highlighted the distinctive profile of HIV+ patients, which differed from that of Cancer and Cardiac patients.

Discussion

The clinical purpose of this research project has been to try and gain a better knowledge of how HIV+ patients view their condition and the factors they see as crucial for them to influence it.

The scientific literature has stressed how radically the introduction of HAART has modified the life expectancy of HIV+ subjects, but less emphasis has been placed on how this new circumstance (i.e. the need to follow treatment scrupulously) can influence their whole life from a psychological point of view.

Consequently, we try and identify a typical profile of HIV+ patients, in terms of how their health-related beliefs influence the organization of their daily life and their lifestyle in the light of this new state of affairs.

The use of an anonymous, self-administered questionnaire seemed well suited to this purpose, since it became possible to attenuate the subjects’ concern about social desirability, at the same time allowing some of their intimate beliefs concerning their pathology to emerge.

A first observation that emerges from our results concerns the HIV+ subjects’ high scores on the Internality subscale, which are the highest of all the groups examined.

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A first observation that emerges from our results concerns the HIV+ subjects’ high scores on the Internality subscale, which are the highest of all the groups examined.

As shown in several previous studies (Strudler-Wallston & Wallston, 1978), subjects with high scores on this subscale are generally skilled at controlling
Table 1a. Testing for measurement invariance of MHLC-C for HIV+ gender and adherent vs non-adherent groups.

| Invariance Hypothesis | HIV+ adherent and non-adherent subjects | HIV+ gender groups |
|-----------------------|-----------------------------------------|-------------------|
|                       | SB-$\chi^2$ (\Delta$SB$-$\chi^2$)* | $df$ (\Delta$df$)* | SB-$\chi^2$/df | RMSEA | NNFI* | CFI* | SRMR | SB-$\chi^2$ (\Delta$SB$-$\chi^2$)* | $df$ (\Delta$df$)* | SB-$\chi^2$/df | RMSEA | NNFI* | CFI* | SRMR |
| Common 4-factor structure | 351.73 | 267 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 330.03 | 266 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| Pattern coefficients | | | | | | | | | | | | | | |
| All | 25.33 | 14 | 1.33 | 0.04 | 0.95 | 0.96 | 0.08 | 23.92 | 14 | 1.25 | 0.03 | 0.95 | 0.96 | 0.09 |
| Only INT | 1.64 | 5 | 1.31 | 0.04 | 0.96 | 0.96 | 0.08 | 1.34 | 5 | 1.23 | 0.03 | 0.96 | 0.96 | 0.08 |
| Only CHA | 14.76 | 5 | 1.33 | 0.04 | 0.95 | 0.96 | 0.08 | 12.11 | 5 | 1.25 | 0.03 | 0.96 | 0.96 | 0.08 |
| Only DOC | 4.97 | 2 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 41.35 | 2 | 1.26 | 0.03 | 0.95 | 0.96 | 0.08 |
| Only OTH | 12.46 | 2 | 1.33 | 0.04 | 0.95 | 0.96 | 0.08 | 0.50 | 2 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| Variances/covariances | | | | | | | | | | | | | | |
| All variances/ covariances | 20.20 | 10 | 1.34 | 0.04 | 0.95 | 0.96 | 0.09 | 7.98 | 10 | 1.23 | 0.03 | 0.96 | 0.96 | 0.08 |
| Only variances | 1.89 | 4 | 1.31 | 0.04 | 0.96 | 0.96 | 0.08 | 23.19 | 4 | 1.25 | 0.03 | 0.96 | 0.96 | 0.08 |
| Only covariances | 16.88 | 6 | 1.34 | 0.04 | 0.95 | 0.96 | 0.09 | 4.45 | 6 | 1.23 | 0.03 | 0.96 | 0.96 | 0.08 |
| Individual variance | INT | 0.29 | 1 | 1.31 | 0.04 | 0.95 | 0.96 | 0.08 | 0.33 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | CHA | 0.01 | 1 | 1.31 | 0.04 | 0.95 | 0.96 | 0.08 | 4.38 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | DOC | 0.92 | 1 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 1.46 | 1 | 1.25 | 0.03 | 0.95 | 0.96 | 0.08 |
| | OTH | 0.38 | 1 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 0.22 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| Individual covariance | INT/CHA | 2.94 | 1 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 2.07 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | INT/DOC | 2.62 | 1 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 0.48 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | INT/OTH | 0.85 | 1 | 1.32 | 0.04 | 0.95 | 0.96 | 0.08 | 0.83 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | CHA/DOC | 42.54 | 1 | 1.34 | 0.04 | 0.95 | 0.96 | 0.09 | 1.12 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | CHA/OTH | 0.24 | 1 | 1.31 | 0.04 | 0.95 | 0.96 | 0.08 | 0.11 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |
| | DOC/OTH | 0.01 | 1 | 1.31 | 0.04 | 0.95 | 0.96 | 0.08 | 0.19 | 1 | 1.24 | 0.03 | 0.96 | 0.96 | 0.08 |

Note. NNFI* = SB-adjusted Non-Normed Fit Index; CFI* = SB-adjusted Comparative Fit Index; INT = internality; CHA = chance; DOC = doctors; OTH = other people. *Only for baseline models these are model SB-f statistic and model $df$; for all others, the entries are $\Delta$SB-f (the increase of $\Delta$SB-f statistic relative to the baseline model due to the additional invariance constraints) and $Adf$ (df difference between the two models).
### Table 1b. Testing for measurement invariance of MHLC-C for HIV+ random samples and pathological groups (HIV+, cardiac surgery patients and cancer patients).

| Invariance Hypothesis | HIV+ random subsamples | Three patients’ groups |
|-----------------------|-------------------------|------------------------|
|                       | SB-$\chi^2$ | df ($\Delta$df)* | SB-$\chi^2$/df | RMSEA | NNFI* | CFI* | SRMR | SB-$\chi^2$ | df ($\Delta$df)* | SB-$\chi^2$/df | RMSEA | NNFI* | CFI* | SRMR |
| Common 4-factor structure | 377.68 | 263 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 523.38 | 410 | 1.28 | 0.04 | 0.95 | 0.96 | 0.13 |
| Pattern coefficients | | | | | | | | | | | | | | |
| All | 23.22 | 14 | 1.45 | 0.04 | 0.93 | 0.94 | 0.07 | 1159.99 | 28 | 1.48 | 0.05 | 0.91 | 0.92 | 0.13 |
| Only INT | 1.54 | 5 | 1.42 | 0.04 | 0.93 | 0.94 | 0.07 | 90.02 | 10 | 1.37 | 0.04 | 0.93 | 0.94 | 0.14 |
| Only CHA | 25.05 | 5 | 1.47 | 0.04 | 0.93 | 0.94 | 0.07 | 44.78 | 10 | 1.30 | 0.04 | 0.95 | 0.95 | 0.13 |
| Only DOC | 1.18 | 2 | 1.43 | 0.04 | 0.93 | 0.94 | 0.07 | 39.95 | 4 | 1.31 | 0.04 | 0.94 | 0.95 | 0.13 |
| Only OTH | 5.76 | 2 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 120.37 | 4 | 1.33 | 0.04 | 0.94 | 0.95 | 0.11 |
| Variances/covariances | 19.61 | 10 | 1.45 | 0.04 | 0.93 | 0.94 | 0.07 | 192.82 | 20 | 1.33 | 0.04 | 0.94 | 0.94 | 0.12 |
| All Variances/ covariances | 6.64 | 4 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 186.16 | 8 | 1.34 | 0.04 | 0.94 | 0.94 | 0.12 |
| Only variances | 11.04 | 6 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 235.82 | 12 | 1.32 | 0.04 | 0.94 | 0.95 | 0.12 |
| Only covariances | | | | | | | | | | | | | | |
| Individual variance | 3.53 | 1 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 0.03 | 2 | 1.27 | 0.04 | 0.95 | 0.96 | 0.13 |
| INT | 0.29 | 1 | 1.43 | 0.04 | 0.93 | 0.94 | 0.07 | 58.50 | 2 | 1.30 | 0.04 | 0.95 | 0.95 | 0.13 |
| CHA | 0.02 | 1 | 1.43 | 0.04 | 0.93 | 0.94 | 0.07 | 8.69 | 2 | 1.32 | 0.04 | 0.94 | 0.95 | 0.11 |
| DOC | 7.88 | 1 | 1.45 | 0.04 | 0.93 | 0.94 | 0.07 | 3.39 | 2 | 1.28 | 0.04 | 0.95 | 0.96 | 0.13 |
| Individual covariance | 1.68 | 1 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 3.14 | 2 | 1.28 | 0.04 | 0.95 | 0.96 | 0.13 |
| INT/CHA | 12.37 | 1 | 1.45 | 0.04 | 0.93 | 0.94 | 0.07 | 60.80 | 2 | 1.29 | 0.04 | 0.95 | 0.95 | 0.12 |
| INT/DOCT | 4.77 | 1 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 11.55 | 2 | 1.28 | 0.04 | 0.95 | 0.95 | 0.13 |
| CHA/DOCT | 0.84 | 1 | 1.43 | 0.04 | 0.93 | 0.94 | 0.07 | 8.23 | 2 | 1.28 | 0.04 | 0.95 | 0.95 | 0.13 |
| CHA/OTH | 3.90 | 1 | 1.44 | 0.04 | 0.93 | 0.94 | 0.07 | 10.05 | 2 | 1.29 | 0.04 | 0.95 | 0.95 | 0.13 |
| DOC/OTH | 0.14 | 1 | 1.43 | 0.04 | 0.93 | 0.94 | 0.07 | 5.00 | 2 | 1.28 | 0.04 | 0.95 | 0.95 | 0.12 |

Note. NNFI* = SB-adjusted Non-Normed Fit Index; CFI* = SB-adjusted Comparative Fit Index; INT = internality; CHA = chance; DOC = doctors; OTH = other people. *Only for baseline models these are model SB-f statistic and model df; for all others, the entries are $\Delta$SB-f (the increase of SB-f statistic relative to the baseline model due to the additional invariance constraints) and $\Delta$df (df difference between the two models).
their pathology and can modify their behaviour patterns, in order to improve their state of health.

It is therefore not surprising to find that HIV+ subjects obtain lower scores on the Chance scale, stressing that HIV+ subjects tend to attribute less significance to ‘fate and destiny’ in determining the course of their pathology.

Together, these two results seem to suggest that the HIV+ subjects would define themselves as informed and aware of the specific ‘commitment rules’ related to HIV-pathology and, therefore, skilled at exercising due control over it.

A second comment can be made about the higher mean score obtained by HIV+ subjects on the Doctor subscale. This result would seem to suggest that HIV+ subjects believe that their clinicians play a crucial role in improving their state of health.

The above result seems to confirm the idea that HIV+ subjects have appropriate beliefs concerning the management of their condition.

Nevertheless, and quite unexpectedly, the results of the study also show that the HIV+ subjects do not seem to attribute such importance to ‘meaningful others’ in the management of their pathology, as underlined by their lower scores in the Other People scale, which are significantly different from those obtained by the other two diagnostic groups (see Table 2).

To sum up, the final overall profile of the HIV+ subjects obtained from the results of the study raises some problems. It is likely that the HIV+ patients not only see the time available for interpersonal relationships as being reduced by their complex therapeutic regime, but mistakenly believe that interpersonal relationships are not strictly necessary for managing their condition. Despite the wide ranging efforts by specialists in this area over the years to overcome the initial social stigma linked to HIV infection, and although the scientific literature has underlined the relevance of interpersonal relations in HIV-pathology management, it seems that HIV+ subjects still have deep-seated difficulties in placing trust in others. Of course, other factors may affect this attitude. Since the multi-group confirmatory analyses showed that the MHLC-C scales measure the same traits in all of the subsamples considered,

Table 2. Means and standard deviations on subscales of MHLC-C by diagnostic groups.

| Diagnostic group | a. HIV+ | b. Cardiac | c. Cancer | Total Sample |
|------------------|---------|------------|-----------|--------------|
| Subscale         | $M$     | $SD$       | $M$       | $SD$         | $M$       | $SD$ | Post-hoc*     |
| 1. Internality   | 3.85    | 1.01       | 3.67      | 0.99         | 3.31      | 0.95 | 3.74          | 1.02 | a = b > c     |
| 2. Chance        | 3.07    | 1.15       | 2.89      | 1.24         | 3.64      | 1.17 | 3.14          | 1.18 | a = b < c     |
| 3. Doctors       | 5.14    | 0.93       | 5.16      | 0.80         | 4.60      | 0.99 | 5.05          | 0.95 | a = b > c     |
| 4. Other People  | 3.18    | 1.12       | 4.12      | 1.15         | 3.93      | 1.28 | 3.41          | 1.20 | a < b = c     |
| Post-hoc*        | $3 > 1 > 2 = 4$ | $3 > 4 > 1 > 2$ | $3 > 4 = 2 > 1$ | $3 > 2 > 1 = 4$ |                |      |               |

Note. *Post-hoc comparison tested with Bonferroni correction, with $p < 0.05$. 

Figure 1. Scale by pathology by gender interaction plot (estimated marginal means).
meaningful comparisons of mean scores across gender- and adherence-defined subgroups of patients are legitimate. We have addressed this issue elsewhere (Ubbiali et al., 2008, this issue) and found significant differences between non-adherent vs. adherent males and non-adherent vs. adherent females. Specifically, the psychological profile of non-adherent males seemed to focus less on relational aspects and on the perceived relevance of physicians and of ‘significant other people’, while that of non-adherent females seemed more relation-oriented.

As a final result, the study confirms the importance of looking beyond manifest behaviour and making an in-depth investigation of the beliefs held by HIV+ subjects, so that appropriate socio-psychological action can be taken. It is not only a question of improving adherence to antiretroviral therapies, but also of enhancing the overall quality of the patients’ life and relationships.

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Note

1. For a more detailed description of this procedure, see Yin and Fan (2003).

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