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Using Analgesics for Emotional Modulation is Associated with Increased Distress, Depression, and Risk of Opioid and Alcohol Misuse: Initial Evaluation and Component Analysis of the Reasons for Analgesic Use Measure (RAUM)

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Abstract

Objectives—It is important to identify aspects of analgesic use that are associated with harm in chronic pain. Historically, the focus has been patterns of use (e.g., overuse). This study evaluated another aspect of use – rather than evaluating *how* analgesics were being used, the primary interest was in *why* they were being used.

Methods—334 analgesic using individuals with chronic pain responded to a pool of items assessing reasons for analgesic use. Measures of pain intensity, distress, depression, and opioid and alcohol misuse were also completed.

Results—Exploratory factor analyses indicated three overarching reasons for use, including taking analgesics: (1) for pain reduction/functional improvement, (2) for emotional modulation/sedation, and (3) to be compliant with prescriber instructions. Correlation and regression analyses indicated that the second factor had the strongest relations with the other measures used, such that greater endorsement of analgesic use for emotional modulation was associated with greater distress, depression, and opioid and alcohol misuse. Using analgesics for pain reduction/functional improvement was associated with greater pain-related distress and depression. Using analgesics to be compliant was not associated with any measure. This pattern of results was generally replicated when a subsample of 131 individuals taking opioids was examined.

Discussion—Results support the utility of examining reasons for analgesic use; use to achieve emotional modulation/sedation may be particularly associated with risk. The data also provide support for the measure developed, the Reasons for Analgesic Use Measure (RAUM).

Keywords

Chronic pain; Analgesics; Risky Substance Use; Reasons for Analgesic Use Measure

Introduction

Analgesic medications are frequently used to treat chronic pain. For example, Breivik et al.'s survey of pain in Europe¹ indicated that almost half of the 4,839 individuals surveyed were taking "over the counter" (OTC) analgesics and two-thirds were taking prescription analgesics. Similar high levels of analgesic consumption have been reported across several other studies (e.g.,²⁻⁷). The frequent use of analgesics for chronic pain treatment is not without controversy, particularly for medications that have potential for misuse or addiction or which can be used recreationally. While opioids are the most common area of controversy at present⁸⁻¹¹, there are multiple analgesic classes which have potential for problematic use^{12,13}. These include muscle relaxants and tranquilizers¹⁴, as well as benzodiazepines, which may have an indirect analgesic effect via their anxiolytic properties¹⁵.

Given the potential for harm present in some analgesics, it is important to identify consumption patterns that are predictive of problems. A common approach has been to identify so-called "aberrant behaviors", such as frequent overuse, deviations from prescribed instructions, the occurrence of lost or stolen prescriptions, simultaneous use of non-prescribed opioids or illicit substances, or evidence of intoxication^{16,17}. The evidence underpinning the accuracy of these approaches, however, suggests that they are not reliable in identifying opioid consumers that will go on to develop substance use problems^{9,18,19}. Thus, there is a need to identify specific qualities of use patterns that better predict problems.

One option for further study involves an examination of the individual's *purposes for analgesic use*. In other words, it may be important to identify *why* individuals are using analgesics as some of these reasons may be reliably related to patient functioning. Consumption patterns that appear similar between different individuals, for instance, may have varying impacts on functioning and quality of life, depending on the specific outcomes that are being pursued.

There are a range of possible reasons for analgesic consumption that can be postulated. From a treatment provider perspective, for example, analgesics are primarily used to reduce pain and improve functioning. Therefore, it may be that patients taking analgesics for these intended purposes experience less pain intensity and pain-related distress, and are at decreased risk of problematic substance use. In addition, analgesics may be used for emotional modulation or for emotional numbing. They may be used primarily to achieve sedation. Clinical experience suggests that individuals may also use analgesics simply because they want to feel like they are doing *something* or that they have no other alternative. For example, in a recent trial examining the feasibility of opioid tapering, Sullivan and colleagues observed that many patients felt that opioids were their only pain management option²⁰. It is also possible that patients are taking analgesics simply because they were told to do so by prescribers. Empirical examination of the accuracy of these reasons, and their relations with functioning, may aid in understanding why analgesics are useful for some people and harmful for others.

The first purpose of the present study was to develop a pool of items related to reasons for analgesic consumption in patients with chronic pain and then perform an exploratory factor analysis on these items to determine if a robust and interpretable factor structure could be identified. Next, we planned to examine how the identified factors related to aspects of functioning, including pain intensity, pain-related distress, and depression, as well as risk of opioid and alcohol misuse. We planned to examine these relations in individuals who were taking any analgesic for chronic pain and also in the subset of individuals taking opioids specifically. It was planned that bivariate correlations would be performed to examine overall relations between the reasons for analgesic use factors and participant functioning and that these would be followed by linear regression analyses to determine aspects of shared and unique variance accounted for by the factors after controlling for relevant demographic and pain-related variables.

Methods

Sampling Procedures

Participants were recruited from Amazon Mechanical Turk (MTurk), an online method of collecting survey data from a national pool. The MTurk system is secure and allows for participant confidentiality, as researchers only have access to an MTurk “worker ID” that is not linked to any protected health information. Participants who completed the survey were paid \$3.00 for their time. This study was approved by the University of New Mexico’s Human Subjects Institutional Review Board.

Potential participants initially completed an unpaid screening survey, which was used to evaluate study inclusion criteria. To be eligible for the study, participants had to report that they experienced pain: (1) on most days of the week (i.e., 4 or more days per week), (2) at an average weekly intensity of 3 or greater on a 11-point numerical rating scale (NRS), and (3) for at least three months in duration. Individuals who did not meet each of these three criteria were not eligible, nor were individuals who experienced only chronic headache pain. In total, 420 individuals met these initial inclusion criteria and began the survey. Of these, 403 (95.6%) provided usable data. For the seventeen individuals who provided unusable data, responses were either missing entirely ($n = 10$) or limited to demographic information only ($n = 7$).

Participant Characteristics

Participants with usable data were asked to list all over the counter and prescribed medications that they were currently taking for chronic pain, including daily dosage. This list was reviewed for each participant by the first author (KEV) and coded to identify individuals who reported taking any analgesic and to identify those who reported taking any opioid medications. For the present analyses, data were used from the 334 participants who met study inclusion criteria and who also reported taking at least one analgesic medication for the treatment of chronic pain. Within this sample, the average number of analgesics being taken was 1.5 ($SD = 0.85$; range: 1 – 6). Of these, 131 (39.2%) reported taking opioid medication. Additional analgesics that were reported included: non-steroidal anti-inflammatories ($n = 187$; 56.0%), acetaminophen ($n = 54$; 16.2%), muscle relaxants ($n = 44$;

13.2%), anti-convulsives ($n = 43$; 12.9%), selective serotonin or norepinephrine reuptake inhibitors ($n = 37$; 11.1%), benzodiazepines ($n = 15$; 4.5%), and tricyclic antidepressants ($n = 5$; 1.5%).

In terms of demographic information, most participants were female, 54.5%, with an average age of 36.6 years ($SD = 11.6$; range: 19 – 73). The majority identified themselves as of White, non-Hispanic ethnicity (76.4%; Asian: 8.0%; Hispanic: 6.5%; Black: 6.2%; Native American: 1.2%; Middle Eastern: 0.6%; Other: 1.1%) and were married or co-habiting with a partner (56.5%; Single: 33.9%; Divorced: 8.3%; Widowed: 1.3%). They averaged 16.6 ($SD = 2.5$) years of education with most reporting completion of a Bachelor's degree (34.9%; Some university: 34.3%; Postgraduate degree: 15.4%; Technical/trade school degree: 8.6%; High school degree: 6.5%; Did not complete high school degree: 0.3%). Over half were employed on a full- (37.2%) or part-time (23.2%) basis. These employed individuals reported missing an average of 2.9 days of work ($SD = 5.8$) due to pain over the preceding three months. For those who were not working, 39.6%, unemployment duration averaged 3.4 years ($SD = 3.7$).

Pain duration averaged 7.0 years ($SD = 6.6$; median: 5.0; range: 3 months to 39 years). The most frequently reported pain site was low back (52.6%), followed by lower extremity (12.1%), neck/head (11.5%), full body (11.2%), upper extremity (6.3%), pelvis/hips (4.2%), mid-back (1.2%), and other (e.g., abdominal; 0.9%). Secondary pain sites were noted by 95 individuals (28.4%).

Measures

Item pool – Reasons for Analgesic Use Measure—A pool of potential items was initially written by the first author (KEV), a clinical psychologist with over 15 years of experience in the assessment and treatment of chronic pain. During this initial stage of development, items were generated across seven broad content areas, which included taking analgesics for: (a) pain relief (e.g., “to help reduce my pain”), (b) functional improvement (e.g., “so I can do more activities”), (c) decreased distress (e.g., “because they help me feel better emotionally”), (d) decreased stress/anxiety (e.g., “so I can relax”), (e) sedation (e.g., “to help me fall asleep”), (f) compliance with prescription/provider instructions (e.g., “because they have been prescribed for me”), and (g) reducing feelings of helplessness/feeling as if one was doing something (e.g., “because I don't know what else to do”). These were conceptual domains used to aid in the generation of specific items and were not assumed to be predictive of eventual factor structure.

Items were rated on a five-point Likert-type scale as follows: 0: *Strongly Disagree*, 1: *Disagree*, 2: *Neither Agree nor Disagree*, 3: *Agree*, 4: *Strongly Agree*. As all items were scored in the same direction, with higher numbers indicating stronger endorsement of the content of each item, we planned to use a simple sum of items to calculate subscale or total scores for the measure.

Following the generation of the item pool, three experts with experience in measure construction and chronic pain were asked to consider the items and provide evaluation and feedback. Based on the suggestions of this group of reviewers, a final pool of items was

constructed by the study authors and was called the Reasons for Analgesic Use Measure (RAUM). Disagreements on the wording of items were resolved via consensus and it was agreed that no items would be deleted from the item pool as initial data collection would aid in the identification of problematic items. These items are listed in Supplementary Table 1.

Measures of participant function—Several measures of functioning were included in the questionnaire battery to evaluate aspects of convergent and divergent validity in the RAUM. These measures were selected based on expected relations with scores on the RAUM, as well as their relevance to patient functioning.

Average pain intensity and pain-related distress over the preceding week were assessed separately using two Numerical Rating Scales (NRS). Each NRS ranged from 0 (no pain/pain-related distress) to 10 (maximal pain/pain-related distress possible).

Depressive symptoms over the preceding two weeks were evaluated using the 16 item British Columbia Major Depression Inventory (BCMDI; ²¹). Possible scores range from 0 – 80, with higher scores indicating more severe symptoms. Previous studies in chronic pain have provided support for the BCMDI's internal consistency, as well as aspects of convergent validity and responsiveness to intervention ^{22–25}. In the present sample, the internal consistency of the BCMDI was acceptable, Cronbach's $\alpha = .90$.

Given hypotheses that reasons for pain medication use would be associated with risk of problematic substance use, two measures of substance use were included. First, the Current Opioid Misuse Measure (COMM; ²⁶) was used to evaluate potential for concurrent risky opioid use. The COMM is a 17-item measure of risk for problematic opioid use and evaluates behavior relevant to analgesic use over the preceding 30 days. It includes a mix of items that ask directly about analgesic use (e.g., “How often have you been worried about how you're handling your medications?”), as well as items that ask about other relevant aspects of functioning (e.g., “How often have you been in an argument?”; “How often have you had trouble with thinking clearly or had memory problems?”). The items of the COMM assess the frequency of behavior on a 0 to 4 scale, with total scores ranging from 0–68 and higher scores indicating greater risk of current opioid misuse. In the present sample, internal consistency was acceptable, Cronbach's $\alpha = .88$. Scores on the COMM were used in correlation and regression analyses for both the larger sample and the sub-sample using opioids. While the COMM has not previously been used in individuals not taking opioids, its item content is relevant to analgesic consumption more broadly and thus we anticipated that COMM scores would potentially be relevant in examining how reasons for analgesic use related to risky analgesic consumption.

We also assessed alcohol use patterns given data that opioid and alcohol co-use is relatively common and is associated with substantial risk of morbidity and mortality ²⁷, as well as the fact that the experience of pain increases the probability of relapse to alcohol use in those treated for alcohol use disorder ^{28,29}. Alcohol use was assessed using the 10-item Alcohol Use Disorders Identification Test (AUDIT; ³⁰). Items range from 0 to 4 and are summed to yield a total score that ranges from 0–40 with higher scores indicating greater probability of risky alcohol use. The AUDIT has been widely used to assess for problematic drinking with

strong evidence of diagnostic accuracy across a variety of clinical and non-clinical samples^{31,32}. The AUDIT's internal consistency in the present sample was acceptable, Cronbach's $\alpha = .89$.

Analytic Approach

Initially, in order to identify potentially problematic items, each of the 34 items in the RAUM item pool was examined to identify extreme skewness, kurtosis, or limited variability. Consistent with extant guidance on normal univariate distribution³³, items with skewness or kurtosis values in excess of two were eliminated. Next, item-total correlations were calculated to identify items that did not correlate appropriately with the measure's total score.

Following the removal of problematic items, exploratory factor analyses (EFA) were performed to identify cross- or low-factor loading items and identify an initial factor structure. A Geomin rotation was used, which allows items and factors to correlate. The determination of the final factor structure was based on a number of considerations, including overall model fit, comparative fit across different factor solutions, scree plot, Eigenvalues, parsimony, and interpretability. Overall and comparative model fit was primarily evaluated using the Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Squared Residual (SRMR), and the Comparative Fit Index (CFI). Established guidelines suggest that good fit is indicated by RMSEA values of 0.05 and lower (with values below 0.10 indicating modest fit), SRMR values of 0.08 and lower, and CFI values of 0.95 and higher^{34,35}. In addition, a 90% CI was calculated for RMSEA to test for "close" model fit, where a significant finding indicates model fit is worse than close. The appropriateness of different factor solutions was evaluated by assessing whether model fit improved with the addition of one more factor, as indicated by a significant chi-square value.

The EFA process was iterative in nature, where potentially problematic items were identified and removed and the analyses repeated until a stable and psychometrically sound factor structure was identified for the RAUM. The EFA process was initially performed in the entire sample of individuals taking analgesics ($N = 334$). Once a stable factor structure was identified, this structure was then evaluated in the sub-sample taking opioids ($N = 131$). All analyses used Mplus version 7.4³⁶.

Once a final factor structure was identified, the psychometric characteristics and utility of the factors was assessed. Internal consistency coefficients were calculated, and the relations among the RAUM factors and other measured variables was evaluated using correlation and multiple linear regression methods. In the regression analyses, gender, age, years of education, pain duration, and usual pain intensity were controlled for statistically. Consistent with the EFA analyses, two sets of correlations and regressions were performed, one for the entire sample taking analgesics and the other for the sample taking opioids.

Results

Factor Analysis of the RAUM

As noted, the entire sample of 334 was used initially to evaluate item level data, as well as the initial factor structure. Frequency distributions of the RAUM items showed five skewed or kurtotic items. These items, which are identified in Supplementary Table 1, were removed from further analyses. None of the remaining items had frequency distributions with over 60% of responses at the extremes. Therefore, 29 items remained for inclusion in the initial EFA, which indicated a total of four factors that had an Eigenvalue close to or greater than one (i.e., 9.2, 4.3, 1.0, 0.99). Chi-square analyses indicated an improvement in fit for 2-, 3-, and 4- factor solutions over solutions that had one fewer factor, all $\chi^2 > 516.9$, all $p < .001$. Solutions with five or more factors failed to converge, indicating their unsuitability for further consideration.

Evaluation of possible factor solutions indicated that a three-factor solution was likely to be the most appropriate, as the four-factor solution had a factor that consisted entirely of low (i.e., single factor loading of .30) or cross-loading items (i.e., loading on two or more factors .40). Initial evaluation of a three-factor solution indicated modest fit, RMSEA: .07 (90% CI: .06 – .07), p “close fit” $< .001$, SRMR: .03, CFI: .91, as a number of cross-loading items were indicated. In total, eight cross-loading items were identified and removed from further analyses. These items are displayed in Supplementary Table 1.

For the final set of 21 items, a three-factor solution continued to appear to be the most appropriate factor solution. Each of the three factors had an Eigenvalue of greater than 1 (i.e., 7.4, 3.7, 2.0), all primary factor loadings exceeded .39 and no cross-loading exceeded 0.17. See Table 1 for rotated factor loadings. Chi-square analyses indicated an improvement in fit for the three-factor model over a two-factor model, $\chi^2 = 236.0$, $p < .001$. Fit of the three-factor solution was acceptable, RMSEA: .06 (90% CI: .05 – .07), p “close fit” = .10, SRMR: .03, CFI: .96.

Evaluation of the items within each factor indicated that item content was both interpretable and logical. The first factor was comprised of items indicating that respondents were taking analgesics for the purposes of pain reduction and functional improvement (e.g., “To help reduce pain”; “So I can do more activities”). This factor was therefore labeled as *Pain/Function*. The second factor was comprised of items indicating that analgesics were being taken for the purposes of emotional modulation or sedation (e.g., “Because they help me feel better emotionally”; “To help me fall asleep.”). This factor was labeled as *Mood/Sedation*. The final factor included items indicating that compliance with prescribed instructions was a reason for analgesic consumption. This factor was therefore labeled as *Compliance*. Descriptive data for these three subscales, as well as the other measures of functioning, are included in Table 2 for the total sample, as well as the subsample of opioid users. We have also included descriptive information on the RAUM and other functional measures for the non-opioid users to provide more complete details of sample characteristics. As noted in that table, internal consistency for all three factors was acceptable, ranging from .83 for the Pain/Function subscale to .94 for the Mood/Sedation Scale.

Following this initial evaluation of factor structure for the full sample, the fit for a three-factor solution was examined using data from the subsample who were using opioids. Fit was adequate in the subsample, and values were similar to those observed in the full sample, RMSEA: .06 (90% CI: .05 – .08), p “close fit” = .11, SRMR: .04, TLI: .95. All items loaded onto the same factors as they had in the analyses using the full sample. Internal consistency for all three factors remained robust, ranging from .78 for the Pain/Function subscale to .93 for the Mood/Sedation Scale.

Correlation and Regression Analyses

Correlations among the three RAUM subscales and the measures of pain intensity, pain-related distress, depression, and substance use were performed next for both the full sample and the opioid-using sample. Results of these analyses are displayed in Tables 3 & 4, for the full sample and opioid-using sample, respectively. Because of the large number of correlations, only those that were significant at $p < .01$ were interpreted.

Overall, RAUM factor scores were significantly correlated with one another (range $r = .21$ to $.39$, all $p < .01$). Further, across both the full and subsample, the Mood/Sedation factor was significantly correlated with all measures of functioning, with the sole exception of pain intensity. In each case where a significant correlation was indicated, the directions were all positive, indicating that as the strength of endorsement of these purposes for analgesic use increased, there were related increases in reported levels of pain-related distress, depression, opioid misuse, and alcohol misuse.

The Pain/Function factor had smaller and less robust relations with these same measures, and was significant only for pain-related distress and depression for the full sample ($r = .16$ and $.17$, respectively, both $p < .05$). While the magnitude of these correlations was modest, the positive direction of the relation is interesting – stronger endorsement of using analgesics for pain reduction or functioning improvement was related to greater levels of reported pain-related distress and depression.

Furthermore, among the full sample, usual pain consistently covaried with the measures of functioning, in that there were positive correlations between usual pain and pain-related distress, depression, and opioid misuse. Interestingly, alcohol misuse and usual pain was negatively correlated ($r = -.11$, $p < .05$), indicating that higher pain levels among the full sample were associated with a decreased incidence of Alcohol misuse. Among the opioid using subsample, usual pain was only significantly correlated with pain-related distress ($r = .22$, $p < .05$).

Finally, the Compliance factor was not significantly correlated with any measure of pain or functioning in either the full or subsample. Given this pattern of correlations, the Compliance subscale was not investigated further in regression analyses.

As the final analytic step, linear regression analyses were performed to examine unique variance accounted for by the two remaining RAUM factors, after controlling for demographic and pain-related factors. The results of these analyses are displayed in Table 5, with the full sample results displayed in the left-hand column and the subsample of opioid

using patients displayed in the right-hand column. The overall pattern of results closely mirrored those of the bivariate correlations.

For the full sample, the RAUM factors did not account for significant variance in pain intensity, nor were Beta values significant. In all other regressions, however, the scales did account for significant unique variance after controlling for demographic and pain-related variables, range $r^2 = .05$ (Alcohol misuse) to $.21$ (Opioid misuse), all $p < .01$. Across these analyses, Beta values for the Mood/Sedation factor were significant in each case, Beta range: $.22$ (Alcohol misuse) to $.46$ (Opioid misuse), all $p < .001$. Beta values for the Pain/Function subscale were significant only for Pain-related Distress, Beta = $.23$, $p < .001$.

For the opioid-using sample, an almost identical pattern of findings was present. The only difference was for Alcohol misuse, where the RAUM factors did not account for significant variance, $r^2 = .02$, $p = .21$. For the three remaining variables of Pain distress, Depression, and Opioid misuse, the variance accounted for by the RAUM factors was significant, although values were smaller than when the full sample was investigated, range $r^2 = .11$ (Depression; Opioid misuse) to $.21$ (Pain distress), all $p < .01$. In each case, the Beta for the Mood/Sedation factor was significant, while it was non-significant for the Pain/Function factor.

Discussion

The primary aim of the present study was to examine *why* individuals with chronic pain were taking analgesics and whether these reasons were meaningfully associated with relevant aspects of functioning and substance use patterns. The results of the factor analysis identified a total of three primary reasons, which included use to: (1) reduce pain and improve function, (2) achieve emotional modulation and sedation, and (3) adhere with provider instructions. The overall results suggest that there may be a particular risk present when one uses analgesics for the second of these reasons. That is, using analgesics for the purposes of emotional modulation or for sedation was strongly associated with greater pain-related distress and depression, as well as increased risk of problematic opioid and alcohol use in the full sample. This pattern was almost identical for the subset who were using opioids, with the sole exception of risk of alcohol misuse, for which the relation was nonsignificant.

It is important to note that these are cross-sectional results, thus the causal direction of relations amongst the measured variables cannot be surmised. It is likely that the observed relations are bidirectional in nature. Nonetheless, these data do suggest that the use of analgesics for the purposes of emotional modulation or sedation may represent a clinically significant marker for potential problems, in that scores on the RAUM Mood/Sedation subscale were reliably associated with greater problems. Thus, even bearing in mind the cross-sectional nature of these data, it seems plausible that the use of the RAUM in individuals taking analgesics for chronic pain may provide a clinically useful screen for the presence of potential problems in other domains.

The other primary reasons for analgesic use identified, including their use for pain reduction and functional improvement or for the sake of adhering with provider orders, were not reliably related to pain intensity, emotional functioning, and risk of substance misuse. It may be that these represent relatively “benign” purposes for analgesic consumption in that they are not associated with significant distress, depression, or risk of opioid or alcohol misuse. That being said, it is curious that greater use of analgesics for their intended purposes of pain reduction and functional improvement was not associated with less pain, pain-related distress, depression, or risk of substance misuse. In fact, in the full sample, greater use of analgesics for this purpose was moderately associated with increases in pain-related distress and depression. If these results are replicated, it will be worth considering why greater endorsement of analgesic use for their intended purpose is not associated with less pain and greater functioning, as common sense would suggest that it ought to be.

From a measure development perspective, these data provide initial support for the RAUM. The three-factor structure appeared statistically robust and internal consistency values were good. These analyses also provide evidence of the RAUM’s discriminant validity, in that only the Mood/Sedation subscale was reliably and positively related to the other measures used. In contrast, the Pain/Function subscale tended to have small, nonsignificant relations with these same measures, with the sole exceptions of modest significantly positive correlations with pain-related distress and depression in the full sample only. In a similar vein, the Compliance subscale was not related to any of the other measures analyzed. It may be that these latter two factors are not all that relevant with aspects of functioning, but it seems appropriate to examine the performance of the RAUM subscales in additional samples to determine the overall relevance and utility in pain settings prior to making firm conclusions.

In addition to these primary implications, it is worth commenting upon the use of the COMM in this sample of individuals with chronic pain. As noted in the introductory portions of this paper, the COMM has not, to our knowledge, been examined within samples of non-opioid using individuals with chronic pain. It is interesting that the pattern of findings observed in the COMM validation studies, where COMM scores are positively correlated with problems in functioning, were also observed in this sample of individuals reporting use of any analgesic for chronic pain. Given that the COMM includes several items assessing the experience of difficult emotions (e.g., anger), it may be that it is also useful in samples who are taking analgesics in addition to opioids.

The strength with which we can draw conclusions from the present results is limited in several ways. First, participants self-reported the presence of chronic pain in an online survey and were not evaluated at any point in this study by healthcare personnel. While our screening measure for the presence of chronic pain assessed pain frequency, intensity, and duration, and is generally consistent with recommended criterion sets for chronic pain, further work is necessary to examine the potential utility of the RAUM, particularly in relation to specifically validating the measure in samples presenting for assessment or treatment of chronic pain. Further, future work may benefit from the inclusion of a formal assessment of respondent compliance with prescribed instructions for analgesic use, as well as an assessment of the item’s susceptibility to social desirability. Second, the generation of

the RAUM items did not include input from people with chronic pain and thus some key reasons for analgesic use may have been omitted. In addition, analgesic use was also self-reported and it is possible that all analgesics were not recorded by participants or that there was inaccuracy in reporting. Furthermore, while we did specifically examine data in individuals who reported consuming prescribed opioids for the treatment of chronic pain, the sample size was modest, and examination of the utility of the RAUM in a larger opioid using sample seems necessary. Descriptively, the overall sample was somewhat younger in age (average age of 36.6) than the typical age of patients presenting for pain treatment, which tends to be mid to late 40's or later in many samples^{1,37,38}. Finally, as noted, all data were collected at a single point of time. Thus, it is not possible to make directional attributions among the relations that were observed here. For example, it is not clear if using analgesics for the purposes of emotional modulation contributes to greater depression or if the relation occurs primarily in the opposite direction.

Given these limitations, potential clinical implications are largely hypothetical. If further study supports the utility of the RAUM and indicates that using analgesics for the purposes of emotional modulation or sedation is reliably related to poorer functioning, then it will be important to determine methods to disrupt this influence. For example, for some individuals, it may be that education surrounding appropriate and inappropriate analgesic consumption is sufficient to decrease use for these problematic purposes. For others, more intensive behavior change interventions, or perhaps more frequent monitoring of analgesic consumption, may be required to address the emotional disruptions more directly or aid in sleep difficulties. If the RAUM can identify those using analgesics for problematic purposes, then it may open the door for corrective intervention.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1Item descriptions and final factor loadings (Geomin rotation; $N = 334$).

Item	Factor 1	Factor 2	Factor 3
To help reduce my pain.	.78 *	-.15	--
To function better physically.	.86 *	--	--
So I can do more activities.	.87 *	--	--
So I can do more around the house.	.61 *	--	.14
Because I'll feel worse if I don't take them.	.56 *	.11	--
To decrease inflammation.	.43 *	--	.14
So I can do more paid or voluntary work.	.39 *	.18	--
Because they help me feel better emotionally.	--	.84 *	--
Because I feel so low.	--	.83 *	--
To make me less tense.	--	.83 *	--
To improve my mood.	--	.83 *	--
To "chill out".	--	.83 *	--
So I don't have to think about or deal with things.	--	.78 *	--
To decrease my worries and fears.	--	.77 *	--
Because they calm me down.	--	.74 *	--
To help me fall asleep.	--	.60 *	--
I take them without thinking about why.	--	.57 *	.12
In order to follow my prescription.	--	--	.85 *
Because they have been prescribed for me.	--	--	.83 *
Because my doctor is trying to help me.	--	--	.75 *
Because my specialist or family doctor has told me to take them.	.17	--	.68 *

Notes:

* denotes primary loading, factor loadings $\geq .10$ are not listed.

Factor labels: 1: Pain/Function; 2: Mood/Sedation; 3: Compliance.

Table 2
Descriptive data for RAUM subscales and measures of pain intensity, pain distress, depression, and substance misuse

Measure	# items	Any analgesic use (N = 340)			Any opioid use (N = 131)			Non-opioid analgesic use (N = 209)		
		M (SD)	Observed Range	Reliability*	M (SD)	Observed Range	Reliability*	M (SD)	Observed Range	Reliability*
RAUM Pain/Function	7	20.0 (5.8)	0 – 28	.83	20.0 (5.3)	0 – 28	.78	19.9 (5.9)	0 – 28	.85
RAUM Mood/Sedation	10	11.0 (9.9)	0 – 40	.94	11.8 (10.4)	0 – 36	.93	10.8 (10.0)	0 – 40	.93
RAUM Compliance	4	8.7 (4.7)	0 – 16	.87	8.8 (4.8)	0 – 16	.87	16.0 (8.7)	0 – 16	.88
Pain Intensity	1	5.0 (1.5)	4 – 10	--	4.9 (1.5)	4 – 9	--	5.0 (1.6)	4 – 10	--
Pain Distress	1	4.9 (2.4)	0 – 10	--	4.9 (2.5)	0 – 10	--	4.9 (2.4)	0 – 10	--
Depression	16	24.8 (14.6)	0 – 78	.90	25.1 (14.6)	0 – 60	.90	24.9 (14.8)	0 – 78	.90
Opioid Misuse	17	12.2 (9.4)	0 – 61	.88	12.8 (8.7)	0 – 48	.86	12.0 (9.6)	0 – 61	.90
Alcohol Misuse	10	4.7 (6.1)	0 – 31	.89	5.8 (6.9)	0 – 31	.90	4.0 (5.5)	0 – 27	.88

* Cronbach's α .

RAUM: Reasons for Analgesic Use Measure; Usual Pain and Pain Distress over the past week measured using a 0–10 Numerical Rating Scale; Depression measured using the British Columbia Major Depression Inventory; Opioid Misuse measured using the Current Opioid Misuse Measure; Alcohol Misuse measured using the Alcohol Use Disorders Identification Test.

Table 3

Correlations among the RAUM subscales and measures of pain intensity, pain distress, depression and substance use for the full sample ($N=334$).

Variable	RAUM Pain/Functional	RAUM Mood/Sedation	RAUM Compliance	Usual Pain	Pain distress	Depression	Opioid misuse	Alcohol misuse
RAUM Pain/Functional	--	.21*	.37**	.05	.16*	.17*	.10	.02
RAUM Mood/Sedation		--	.33**	.05	.28**	.33**	.47**	.25**
RAUM Compliance			--	.06	.11	.10	.05	.05
Usual Pain (past week)				--	.29**	.21**	.19*	-.11
Pain Distress (past week)					--	.51**	.33**	.07
Depression						--	.52**	.10
Opioid misuse							--	.30**
Alcohol misuse								--

*
p .01;

*
p .001

RAUM: Reasons for Analgesic Use Measure; Usual Pain and Pain Distress over the past week measured using a 0–10 Numerical Rating Scale; Depression measured using the British Columbia Major Depression Inventory; Opioid Misuse measured using the Current Opioid Misuse Measure; Alcohol Misuse measured using the Alcohol Use Disorders Identification Test.

Table 4

Correlations among the RAUM subscales and measures of pain intensity, pain distress, depression and substance use for opioid users ($N = 131$).

Variable	RAUM Pain/Functional	RAUM Mood/Sedation	RAUM Compliance	Usual Pain	Pain distress	Depression	Opioid misuse	Alcohol misuse
RAUM Pain/Functional	--	.22**	.39**	-.14	-.06	.01	.10	-.04
RAUM Mood/Sedation		--	.35**	-.10	.33**	.33**	.34**	.23*
RAUM Compliance			--	-.12	.03	-.06	-.06	.06
Usual Pain (past week)				--	.22	.17	.10	.07
Pain Distress (past week)					--	.57**	.33**	.14
Depression						--	.61**	.19
Opioid misuse							--	.31**
Alcohol misuse								--

*
 $p < .005$;

**
 $p < .001$

RAUM: Reasons for Analgesic Use Measure; Usual Pain and Pain Distress over the past week measured using a 0–10 Numerical Rating Scale; Depression measured using the British Columbia Major Depression Inventory; Opioid Misuse measured using the Current Opioid Misuse Measure; Alcohol Misuse measured using the Alcohol Use Disorders Identification Test

Table 5

Linear regression results

Step	Variable	Any analgesic use (N = 340)		Any opioid use (N = 131)	
		r ²	β (final)	r ²	β (final)
<u>Usual Pain</u>					
1.	Age	.02	-.06	.02	-.11
	Sex (0=male, 1=female)		.08		.06
	Years of Education		-.09		-.01
	Pain Duration		.02		
2.	RAUM Mood/Sedation	.003	.02	.03	-.10
	RAUM Pain/Function	—	.04	—	-.14
	Total r ²	.02		.05	
<u>Pain-related Distress</u>					
1.	Age	.03+	-.10 ⁺	.03	.06
	Sex (0=male, 1=female)		.05		.09
	Years of Education		-.02		-.07
	Pain Duration		-.002		.07
2.	Pain Intensity (past wk)	.07 ^{***}	.26 ^{***}	.04 [*]	.22 ^{**}
3.	RAUM Mood/Sedation	.08 ^{***}	.23 ^{***}	.12 ^{***}	.36 ^{***}
	RAUM Pain/Function	—	.11 [*]	—	-.09
	Total r ²	.18		.19	
<u>Depression</u>					
1.	Age	.03	-.07	.04	-.03
	Sex (0=male, 1=female)		.07		.07
	Years of Education		-.01		-.07
	Pain Duration		.03		-.09
2.	Pain Intensity (past wk)	.04 ^{***}	.19 ^{***}	.03+	.21 [*]
3.	RAUM Mood/Sedation	.11 ^{***}	.29 ^{***}	.11 ^{***}	.35 ^{***}
	RAUM Pain/Function	—	.11 ⁺	—	-.03

Step	Variable	r^2	β (final)	Any analgesic use ($N = 340$)	Any opioid use ($N = 131$)
<i>Total r^2</i>		.18			.14
<i>Opioid Misuse</i>					
1.	Age	.04 [*]	-.08+	.09 [*]	-.13
	Sex (0=male, 1=female)		.01		.03
	Years of Education		-.01		-.04
	Pain Duration		-.10 [*]		-.17 [*]
1.	Pain Intensity (past wk)	.03 ^{***}	.17 ^{***}	.01	.12
2.	RAUM Mood/Sedation	.21 ^{***}	.46 ^{***}	.11 ^{***}	.35 ^{***}
	RAUM Pain/Function	—	.002	—	-.09
<i>Total r^2</i>		.28		.07	
<i>Alcohol Misuse</i>					
1.	Age	.02	-.07	.04	-.13
	Sex (0=male, 1=female)		.07		.02
	Years of Education		-.03		-.07
	Pain Duration		-.05		-.07
1.	Pain Intensity (past wk)	.01 [*]	-.13 [*]	.03 [*]	-.16 ⁺
2.	RAUM Mood/Sedation	.05 ^{***}	.22 ^{***}	.02	.17 ⁺
	RAUM Pain/Function	—	-.03	—	-.03
<i>Total r^2</i>		.08		.09	

⁺ *p* .10,

^{*} *p* .05;

^{**} *p* .01;

^{***} *p* .001

RAUM: Reasons for Analgesic Use Measure; Usual Pain and Pain Distress over the past week measured using a 0–10 Numerical Rating Scale; Depression measured using the British Columbia Major Depression Inventory; Current Opioid Use measured using the Current Opioid Misuse Measure; Current Alcohol Misuse measured using the Alcohol Use Disorders Identification Test.